FLIGHT

First Aero Weekly in the World.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM.

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THIRD AERO SHOW AT OLYMPIA.—Two general views of the large hall, showing the machines staged on either side, with the motor boats down the centre of the hall.

THE AERONAUTICAL SOCIETY'S POSITION.

THERE is evidently something very radically unsatisfactory with either the constitution or the conduct of the Aeronautical Society of Great Britain. How comes it that this, the oldest aeronautical body in the world, is reduced to the parlous state of practically living on charity? That is plain speaking, but it is amply justified by the showing of the balance sheet for the year 1910, from which we gather that of an income of, in round figures, of £500 just half was contributed by way of donation by Mr. Patrick Alexander. Even with the aid of so munificent a gift, the affairs of the Society were conducted at a loss—a small one, it is true, but nevertheless a loss. We do not mean to suggest that all the useful work of which the Society is capable should be carried out for a maximum expenditure of £500 per annum. To conduct all the scientific work which properly falls within its province might well mean an expenditure of much more than the sum named, but it is an axiom that bricks cannot be made without straw, and surely the time has arrived when the Society should calmly and sanely sit down to discuss whether it has an adequate supply of straw to justify it continuing the same methods in the brickmaking business.

To outward appearances at least the whole conduct of the affairs of the Society exhibits a deplorable want of business ability. Look, for example, at the ballot-paper which has been sent out to members with the notices relating to the annual general meeting. Anything more grotesque than the form in which the paper is drawn we have never seen during the course of a long association with the conduct of public bodies. A list of names is given which it is suggested should form the *personnel* of officers and council for the coming year, twelve in number, and each name has a blank space beside it for the purpose of the insertion of an alternative name if the individual voter feels so disposed. It is utterly immaterial to our argument what names appear on the paper; but we do say that the ballot (*sic*) is nothing more than the rushing through *en bloc* of the nominees of the present council. Most emphatically do we acquit the members of the council of any ulterior motive in having drawn the ballot paper in its present form; but our criticism is that it is not a ballot at all and that the whole proceeding is an apt indication of the lack of business up-to-dateness which runs through the whole of the Society's conduct. The proper plan, of course, would have been to ask in advance for nominations from the whole membership so that all the names of those willing to serve would have been on the ballot-paper and an opportunity would have been given to the Society at large to select its own representatives. Another instance of the hopelessly childlike way in which this ballot (save the mark) has been conducted. The voter is naively told on the paper that his name must not be signed anywhere on the paper —because the essence of the ballot is secrecy, we presume. And yet he gets two envelopes, one to contain the ballot-paper, which is then placed in the other *and the member's name is to be signed on the outer envelope.*

But all this is of minor importance in itself, leading nowhere in particular. It is, of course, always necessary to point out shortcomings in order to arrive at an understanding of why the reform of any particular institution happens to be essential. Few members of the Society are likely to argue that all is well with it. The question now is how to find its proper *metier* and the ways and means of continuing the Society as a useful institution.

By its understanding with the Royal Aero Club and the Aerial League, the Society remains the national body to whom to look for the conduct of the scientific or theoretical side of aeronautics. Now, scientific research and inquiry was one thing in the days before dynamic flight had actually been achieved; but it is altogether another matter now. Practically, in those early days, membership of the Society implied far-sighted confidence in the ultimate achievement of mechanical flight, and nothing was more natural than for all enthusiastic believers—whatever might be their technical attainments or their mere powers of imagination—to band themselves together under the ægis of a recognised body. Clearly, however, there is no place to-day for the mere *believer* in the possibility of flight, since every man in the street is considerably more convinced of its prospects than was the most sanguine of the earlier day visionaries. In other words the whole position has changed as regards the needs and functions of the Society, and yet no apparent commensurate change has yet come over its programme or its basic management and constitution. One might indeed almost go so far as to say that if those estimable amateur enthusiasts who controlled the destinies of the oldest aeronautical institution in the world were in every way equipped for holding the reins of office prior to the great change of a few years ago, it almost stands to reason that few if any of them are likely also to possess the progressive and semi-professional characteristics that are essential to the needs of the Society now. Possibly, too, there may even be a certain small section of the membership that no longer really require representation of the scientific kind at all, whereas on the other hand there must most certainly be a very vastly greater number of practical investigators and students wanting an organisation of an up-to-date technical kind where they can thrash out the more pressing theoretical problems of the hour in a manner calculated directly to benefit the cause.

Apparently, therefore, the Aeronautical Society should seriously be taken in hand without delay by the membership. There is ample scope for invaluable work, and a real live scientific society would not find it difficult to secure an ample supply of funds to meet its most urgent needs; while hundreds of workers in the field of flight would seek to associate themselves with the institution if membership, or if fellowship, or if any other distinguishing classification were to carry with it a high standing of a recognised social kind. It is doubtless much too early days to talk of any aeronautic institution comparable in nature to the Institution of Automobile Engineers. That is rather for the technical men of the industry when it has settled down—and when everyone in the industry has come to know who is who—as distinct from the theoretical men of the movement, who very rightly now wish to sort themselves out from the purely superficial posers of whom the public are apt to hear too much. Research is as essential at the present day as it ever has been in the past, while systematic research is obviously considerably more practicable now than it has been heretofore. If the sole activities of a reconstituted Aeronautical Society were to be concentrated upon the drafting of a rational programme, setting forth the precise lines that might best be followed by those equipped for the conduct of scientific research, it would well justify its existence in the eyes of the world. For our own part, we should be surprised if this were not to lead but little later to the Society itself taking an active part in such work.

Flight Pioneers.

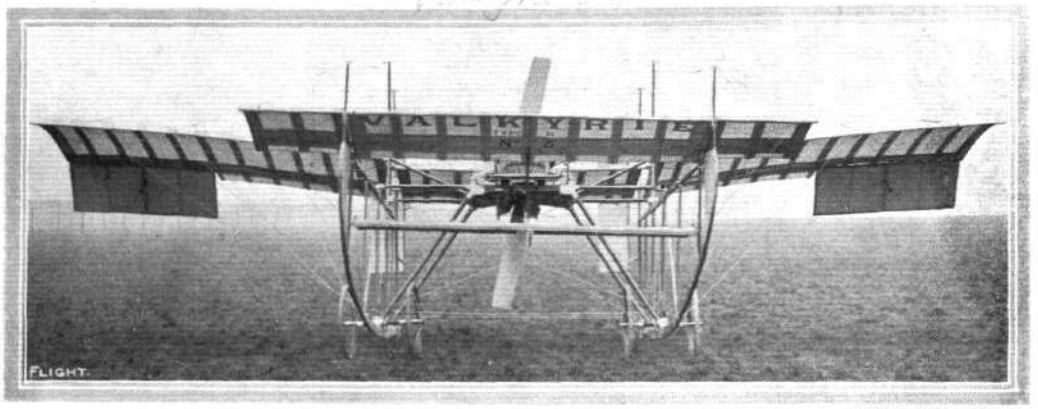
MR. GUSTAV HAMEL.

THE VALKYRIE RACER.

It was about this time last year that we first drew our readers' attention in any marked degree to the Valkyrie monoplane, then known as the "A.S.L.," from the initial letters of the Aeronautical Syndicate, Limited, who now, as then, represent the commercial side of the business. It is, therefore, appropriate that we should again refer about Show time to the latest of these machines, and in doing so it is only proper that we should say a few words of congratulation on the steady progress of the firm during the past twelve months. When the Valkyrie monoplane was first introduced to readers of FLIGHT it had already flown, but that was about all, and no doubt a good many of those who were interested in its peculiar design wondered whether this tail first idea was going to be any good at all. The Aeronautical Syndicate were the first to establish themselves at Hendon, and in the inconvenient conditions that then existed it took some little while to get settled; but from that time onwards they have done their best to prove the merits of their machine on every decent flying day, and those who are interested have, therefore, no excuse for not satisfying themselves as to the appearance and general behaviour of the tail first monoplane in the air.

It is, of course, all the more interesting to be able to record Valkyrie progress, because the machine is, after all, essentially British, both in design and construction, and it is only right that all who are following aviation should watch with a kindly eye the evolution of anything that goes particularly to the credit of British brains. Commercially it is often wiser policy to copy a standard article, and initiative in design is therefore all the more worthy of appreciation and encouragement, and there is, at least, this to be said for the Valkyrie that it is no copy of anything else.

The latest machine, of which the accompanying photographs and sketches are illustrations, is known as the type "B" racer, and in appearance is characteristically different from its prototypes, although, as a matter of fact, the difference in question is merely a marked optical effect produced by a relatively small structural alteration. The present machine has its main planes closer to the ground than formerly, the height from the skids to the main fore and aft girders of the carriage being 4 ft. The result of this shortening of a very important dimension, so far as the perspective of the machine is concerned, has made a marked difference in its general appearance, especially when it is standing on the ground. Also, of course, being a racer it is generally smaller and lighter-looking in all its principal parts. The span is 31 ft.; the overall length 26 ft., which includes the increased distance at which the rudder planes are now carried behind the main plane; and the total weight is only 550 lbs. The general design of the main plane, which is, as before, built in three sections, has been somewhat modified by the introduction of a marked dihedral angle and a slight arching of the wings. The central portion of the main plane, which has a span of 8 ft. 4 ins., has its leading edge set back in order to clear the propeller. The trailing edge is in line with the trailing edges of the wings, and consequently the chord is less than the full chord of 6 ft., which characterises the wing members. About 12 ft. in front of the main planes is the fixed leading plane, which can be set to any required attitude, according to the load carried



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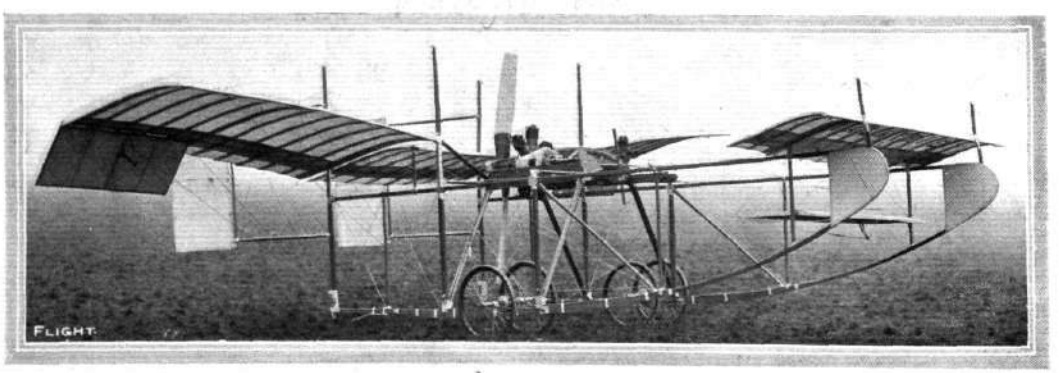
Front view of the Valkyrie racing-type monoplane.



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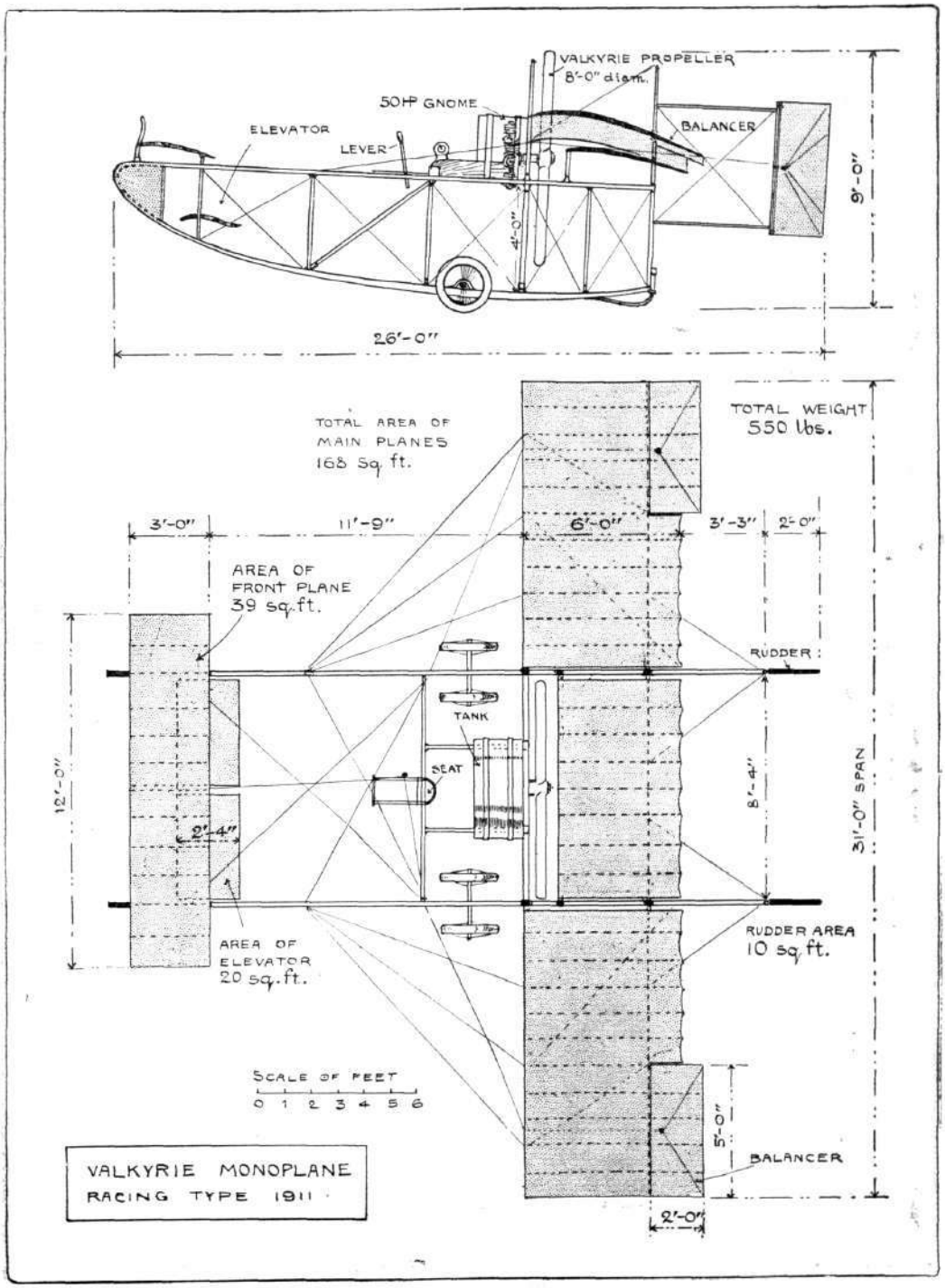
View from the side of the Valkyrie monoplane racer.



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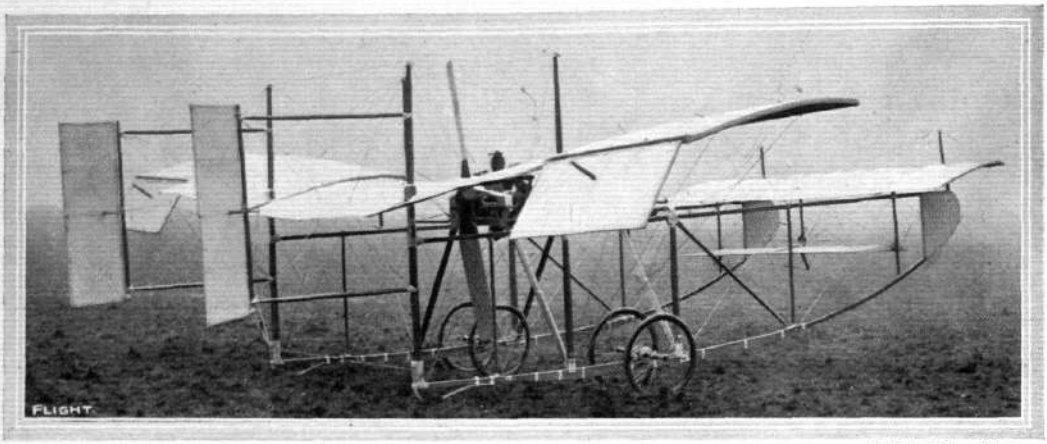
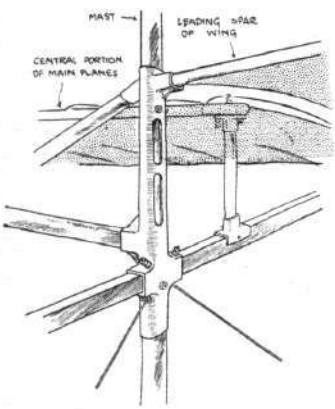
VALKYRIE RACER.—Plan and elevation to scale.



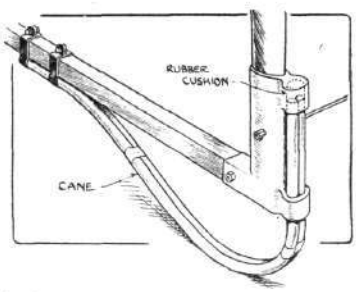
View of the Valkyrie monoplane racer, showing the hinged balancing-planes and the outrigged rudders.

and general balance of the machine. Beneath this leading plane and a little to the rear thereof is the movable elevator, which on this machine is characterised by a slightly upturned trailing edge. Balancing planes are let into the trailing extremities of the wings, and rudder planes are mounted on two outriggers that form extensions to the under-carriage, but are raised to the level of the main plane.

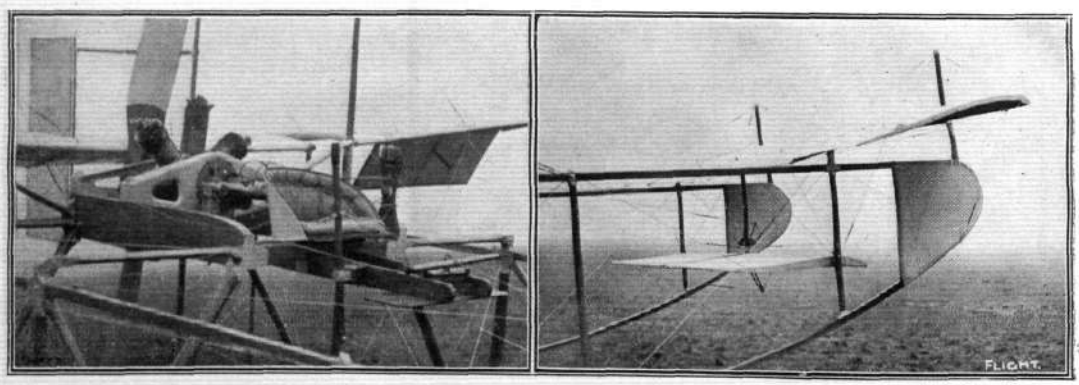
A characteristic feature in the construction of the Valkyrie monoplane is the use of guy wires of large section, which are screwed at their extremities and fastened and adjusted by nuts so as to avoid bending the wires for this purpose. On the present machine a Gnome rotary engine is fitted, which contributes considerably to the neatness of the design, because constructional considerations make it necessary to have the engine in the centre, and on a one man machine the pilot has to sit in front of the engine. Any saving of length is, therefore, an advantage, inasmuch as it facilitates the concentration of the principal masses about the actual centre of gravity. The control of the machine may be described as arranged on the Farman principle, for the elevator and balancers are operated by the universal motion of a pivoted upright lever conveniently situated for the pilot's right hand, and the rudder. planes are controlled by a pivoted foot-rest. A minor feature that affects the external appearance of the machine is a very neat saddle tank surrounding the engine. This tank is of horseshoe shape, and contains compartments for petrol and oil. It is mounted rigidly on the engine frame.



Sketch of the aluminium sockets as used for the attachment of the wings.



Sketch illustrating the cane fender under the rear end of the skid of the Valkyrie racer.



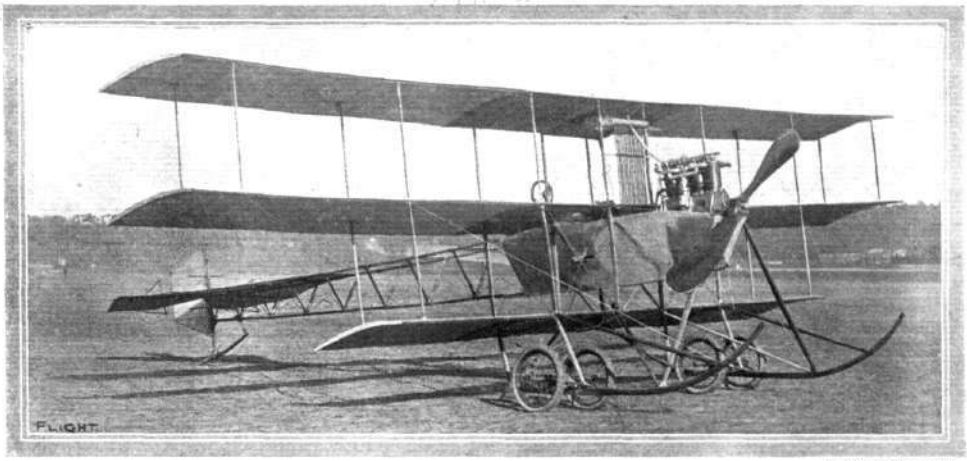
Detail views of the Valkyrie monoplane racer, showing (on the left) the pilot's seat and mounting of the Gnome engine. The right-hand view shows the two small "prows" under the fixed front plane.

FLIGHT

THE ROE TRIPLANE.

Going back into the early days before flying was popular and practical encouragement mostly conspicuous by its absence in England, the figure of A. V. Roe stands out in a kind of forlorn loneliness that is peculiarly British. Inspired by the conviction of the great future of flight, energised by the enthusiasm of the true pioneer, but handicapped always by lack of the wherewithal to do the thing properly, Roe struggled laboriously to achieve what, nowadays, is an almost ordinary accomplishment. Even to-day, however, he is still original in his ideas, and his firm build the only triplane on the world's market. Regarded purely from a commercial standpoint it is possibly a pity that the Avro-plane, as Roe called his machine long before it would fly, did not belong to one of the more popular types, for popularity is the greatest of all commercial assets these days, whether as a matter of business or pleasure.

On the other hand there is nothing so fickle as this aspect of fortune, and in the present struggle between the inherently fast monoplane and the evolved light biplane racer, it may yet be that the triplane shall come to its own. Fundamentally the problem of flight is to obtain the greatest supporting area for the least weight and the principle of superposed planes, so strongly advocated by such early pioneers as Wenham and Phillips, is by no means necessarily limited to the biplane formation, originated by Chanute, that is so popular to-day. The three-decker built with the monoplane type body is, as may be seen by the accompanying illustrations, by no means an ungainly machine, and it is at least interesting that its outstanding feature, which is the combination of the monoplane body with multiplane wings, has already found its way into general biplane construction, and characterises one or two of the prominent machines at Olympia this year.



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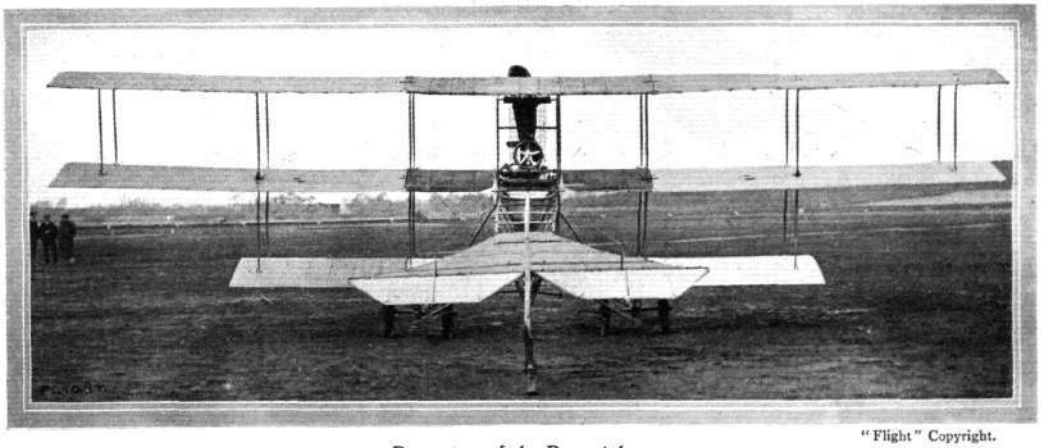
General view of the Roe triplane from in front.

Not unnaturally the Roe triplane has undergone many modifications in design, but its present form is unquestionably the most shipshape, as it is likewise the best flyer. Originally a machine that was practically a tandem triplane was constructed, but the multiplane tail member gave place to a simple monoplane directive organ that carries none of the essential load. The system of control, too, is now more or less conventional, the tail member carrying a single plane vertical rudder between the two parts of the divided monoplane elevator that form hinged extensions on a rigid triangular tail. The elevator is operated by a to-and-fro motion of the steering column, while the rudder is controlled by a pivoted cross-bar forming a foot-rest. A steering wheel mounted at right angles to the axis of the pivoted column is the means of maintaining lateral balance by warping the wings, but it



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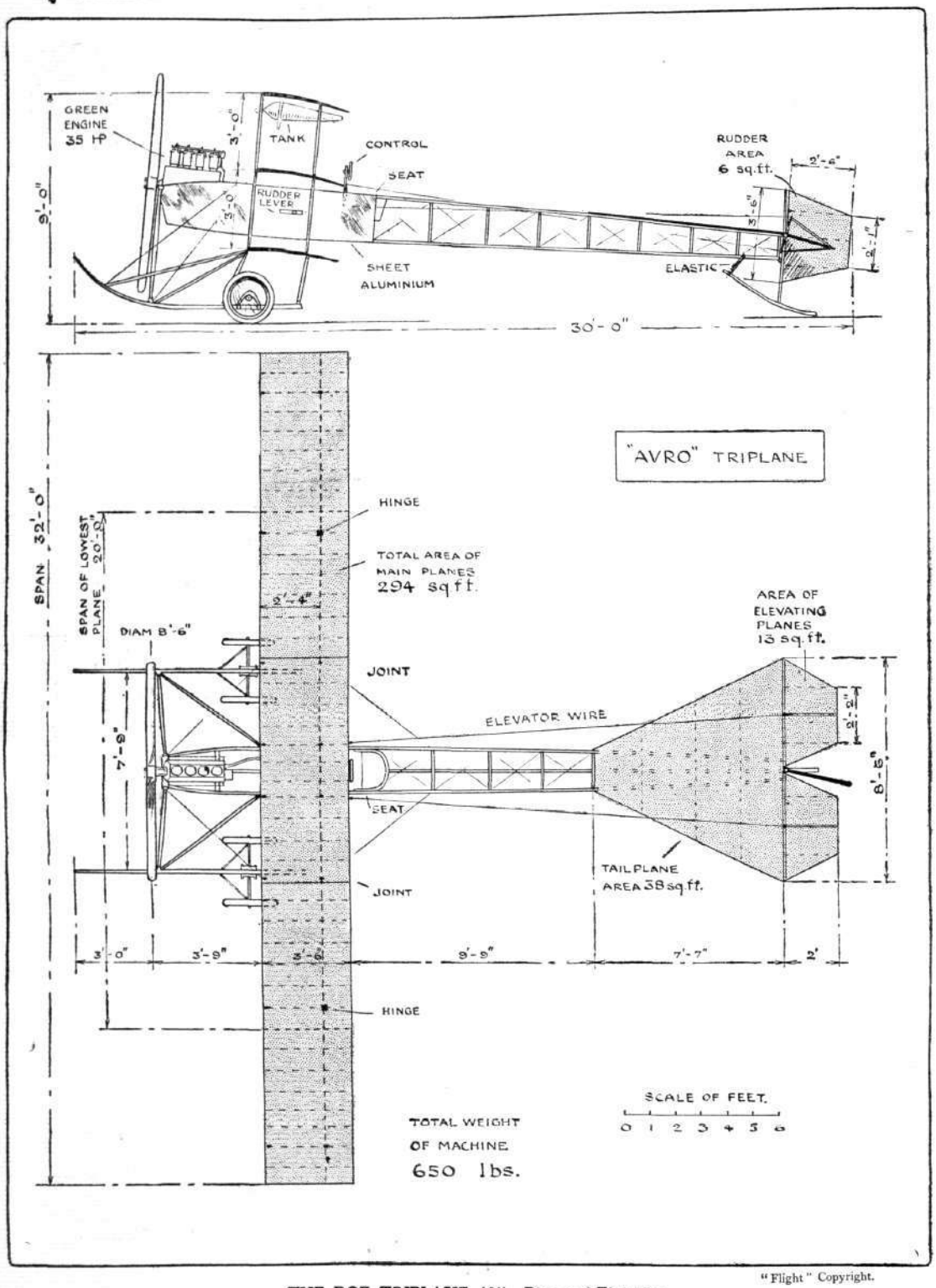
Rear view of the Roe triplane.



THE ROE TRIPLANE, 1911.—Plan and Elevation.

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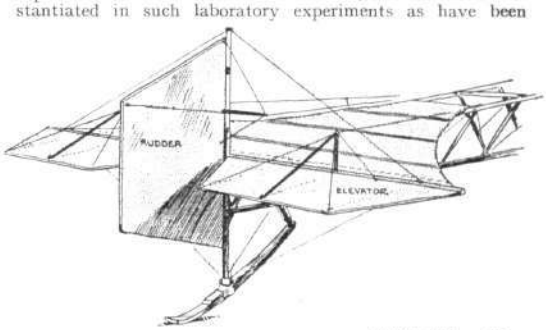
General view of the Roe triplane from behind.

will be observed that in the latest machine the lowest of the three planes has less span than the others, and it is only the latter that are influenced by the warping movement.

The body of the machine is an open triangular section girder made of ash and trussed with wires. It is situated just beneath the level of the middle plane, and its fore part is cased in from the engine to the pilot's seat. The engine itself, as may be observed from the illustrations, is mounted high up in the bows, and the direct driven propeller is some little distance in front of the leading edge of the planes. A simple undercarriage, supported on the Farman principle by four wheels mounted independently in pairs on the two skids, serves to support the entire weight of the front part of the machine, while the tail is kept clear of the ground by a rocking skid anchored to the frame by a piece of elastic.

A minor detail of construction indicative of thoughtfulness in design can be seen in the sketch of the mounting of this tail skid, which shows how it has been provided with a special rocker-shaped surface where it takes abutment against the base of the rudder post. Some other interesting constructional details are also illustrated in the sketches, which show the method of fitting the end struts of the main planes loosely into their sockets, and taking the tension by auxiliary tie-wires in order to facilitate the warping of the wings. Another detail illustrated by a sketch is the method of anchoring the diagonal tie-wires to thin steel plates that are clipped against the spars of the body by the principal aluminium brackets.

A characteristic feature of the Roe machine, considered as a triplane, is, of course, the relatively high aspect ratio of its planes. Owing to the fact that it has three planes, the same equivalent surface is available from a given span with a considerably reduced chord, and consequently the ratio of span to chord in each plane, which is termed the aspect ratio, has a higher value than is ordinarily to be found in biplane construction. In the machine illustrated a span of 32 ft. is accompanied by a chord of 3 ft. 6 ins., which corresponds to an aspect ratio of over nine. In most biplanes the same factor seldom exceeds six, and in monoplanes it is still less likely to be as high. The advantage of a high aspect ratio is fundamental in character, and has been substantiated in such laboratory experiments as have been



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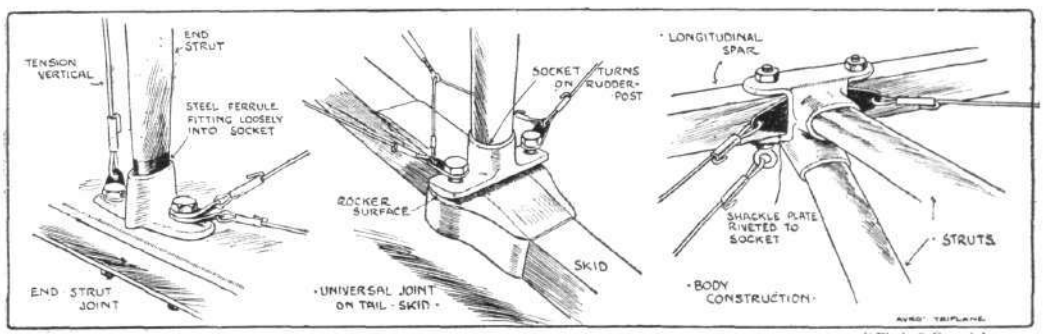
Sketch of the tail on the Roe triplane.

conducted. It is concerned with the leakage of air over the extremities, which leakage bears a smaller percentage of the total volume of air dealt with as the aspect ratio increases for a given area of plane. Fundamentally, therefore, the triplane is potentially a more efficient combination than the biplane—provided always that other practical considerations do not interfere with the realisation of this feature—and it is at least to Mr. Roe's credit that he has flown with less power than anyone.



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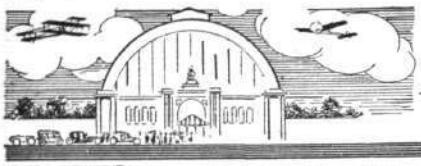
Sketches illustrating some constructional details on the Roe triplane.

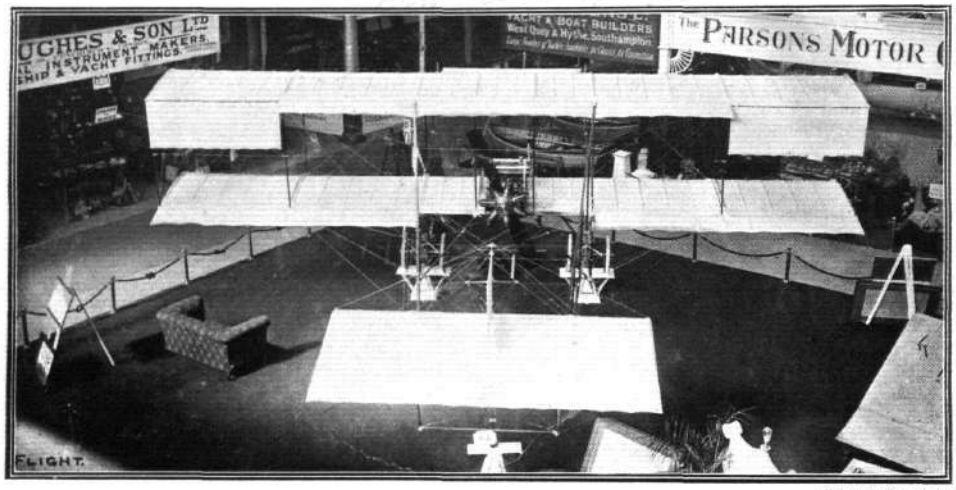


THIRD INTERNATIONAL AERO EXHIBITION AT OLYMPIA 1911

THE EXHIBITS ANALYSED.

THE Olympia Aero Show, which opened on Friday of last week and closes to-day (Saturday, April 1st), has unquestionably realised all anticipations of exceptional interest. It is true that the exhibits might have been more numerous; but there are, after all, twenty different machines on view, ten of which are monoplanes and ten biplanes—which fact in itself is additionally interesting, as indicating the balance of opinion that exists at the present time as to the relative merits of the two types. Each type has, of course, its own particular advantages, which are emphasised or deprecated by individual designers according to their own personal view of what problems are most in need of immediate solution.

At the present Show the keynote in design is struck by the prevalence of enclosed bodies, a feature that characterises the majority of the machines present, and is of itself of the greatest interest and importance. At one time, as readers of FLIGHT will remember, constructors used to be very particular about adopting stream-line form for struts and other small members; but practical considerations soon showed that this refinement scarcely warranted—by any increase in efficiency that it afforded—more attention than could be conveniently bestowed upon it in the ordinary course of construction. If struts and spars could conveniently be made of stream-line form without undue extra expense, all well and good; if, on the other hand, it was more convenient to make them rectangular, then some leading firms, at least, made no bones about ignoring the purely scientific side of the problem. As a matter of fact, moreover, this elaborate application of pure theory to practice is very apt to ignore practical considerations that are not taken into account in the theoretical hypothesis. For instance, aeroplanes nowadays no longer only fly in the calm; and, indeed, the art



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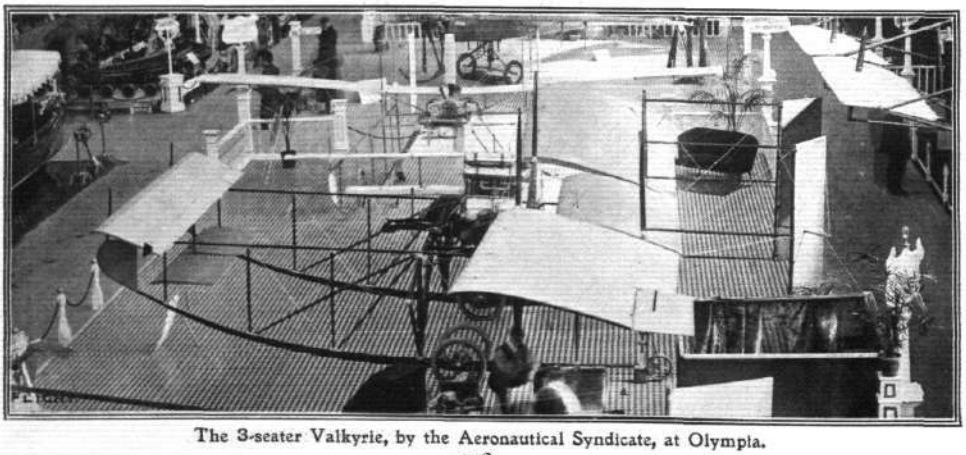
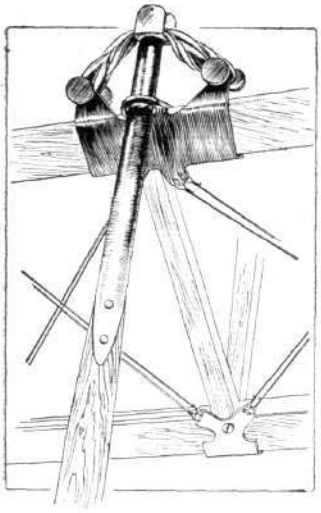
Rear view of the Howard Wright biplane.



The 3-seater Valkyrie, by the Aeronautical Syndicate, at Olympia.



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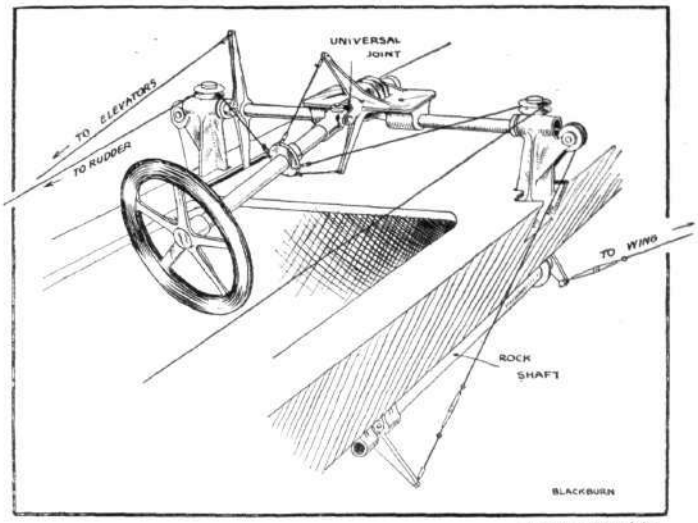
Sketch illustrating the crutch suspension of the Bristol monoplane.



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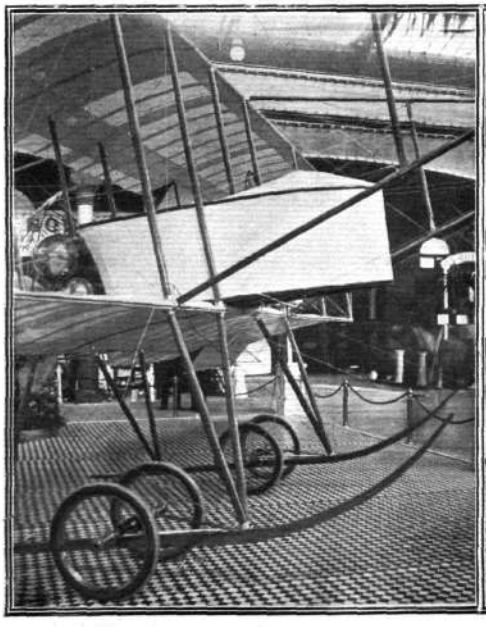
Sketch illustrating the control on the Blackburn monoplane.

of aviation has progressed to an extent sufficient to enable pilots to navigate the atmosphere when the wind is blowing at a velocity that represents, numerically, a fairly high percentage of their own flight speeds. If, therefore, the wind is not blowing in the line of flight, the axes of stream-line forms on the machine will be more or less athwart the relative wind, and much of the advantage of the special shape will thus be set at nought. While this argument holds good in connection with the struts and other members that are relatively small compared with the machine as a whole, it does not necessarily apply with equal force to the question of enclosing the whole of the principal masses in a casing of stream-line form. The engine and the pilot offer a very considerable extent of surface that does nothing but oppose the flight of the machine by the resistance of the normal air pressure upon it.

Clearly this is neither the time nor place to deal with the mathematical and technical aspects of this most important subject; but suffice it to say that, as far as theory is able to indicate at the present time the use of stream-line casings offers every opportunity for effecting an important saving. Hitherto, of course, it has been of less moment to pay very much attention to this matter, as other more pressing considerations have called for immediate notice; but with the



An example of enclosed pilot's seat on the Bristol military-type biplane.

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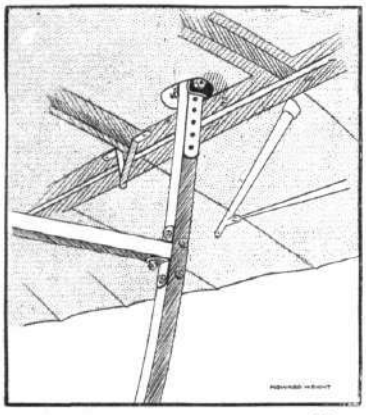
The latest idea in suspension. How the Bristol monoplane is supported on crutches.

general tendency towards increase in speed—and, incidentally, the fact that high speed is of first importance in the prospect of winning the *Daily Mail* £10,000 prize—the question of body resistance becomes one of fundamental importance. The enclosing of the engine and pilot in a stream-line casing is, moreover, an altogether different matter from the mere shaping of individual struts.

At Olympia this year, then, stream-line bodies are the predominating feature in design. In the degrees of completeness they range all the way from the new Piggott monoplane which has every part of the body, the engine, pilot and passenger completely enclosed in a large torpedo-shaped casing with a hemispherical head. This represents the extreme development of the stream-line idea and it will be interesting to watch how far this whole-hearted adoption of a good principle works out in practice. Generally speaking such things are best evolved by degrees, and we do not doubt that it will be necessary to cut a few more holes in the Piggott shell before it satisfies the requirements of the average pilot. It will, at any rate, take, we should imagine, some little time to get used to being completely boxed in, for even as it is, with orthodox machines, aviators often complain of impeded vision. On the Piggott machine the outlook is entirely through windows made of insoluble gelatine, and the passenger and the engine are both situated in front of the pilot. The propeller boss, which is conical, forms a revolving pointed nose on the otherwise hemispherical head of the body.

An almost equally pronounced example of enclosed body-work is given by the Kny aeroplane, constructed by Messrs. Mulliner of London and Northampton, but in this machine the body is boat-like in form, and the pilot and passenger can have, at any rate, nothing but sky above them if they care to detach the conning tower cover plate. Like the Piggott, the stream-line body of the Kny aeroplane extends to the tail, and the latter part of it is fabric-covered. In front, the outer surfacing material is sheet aluminium. On the Piggott machine, the surfacing material is entirely fabric. Fabric is also used for enclosing the framework of the Nieuport monoplane, for which Maurice Ducrocq has the agency. In this machine, however, the rectangular section of the main frame has not been enclosed by any supplementary casing as on the Piggott monoplane, and consequently the sides of the body are flat. In appearance, however, the Nieuport monoplane distinctly belongs to the class under consideration, although possibly its right to such classification is based more on appearance than actual design, for there is little doubt that the small size of the horizontal twin-cylinder engine in front considerably enhances the stream-line appearance of the body, which, if fitted with a more conventional motor, might call for less comment, on account



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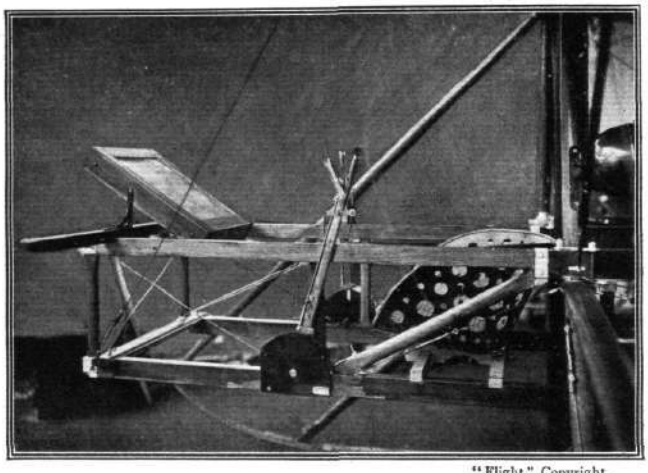
Sketch showing the arrangement of the framework at the tail of the Howard Wright machine.



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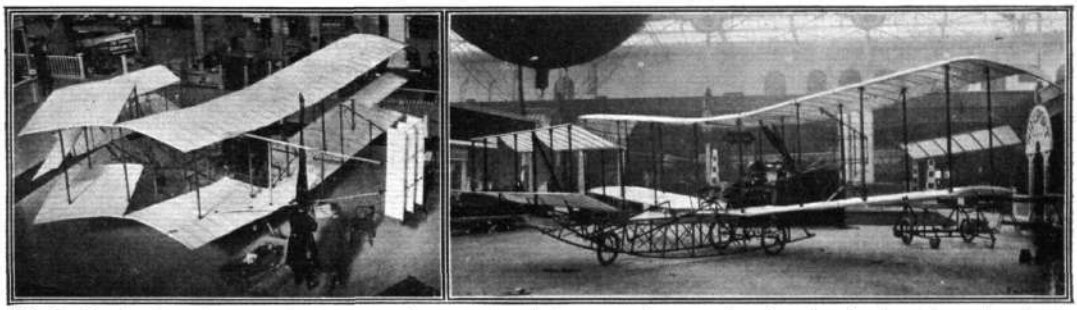
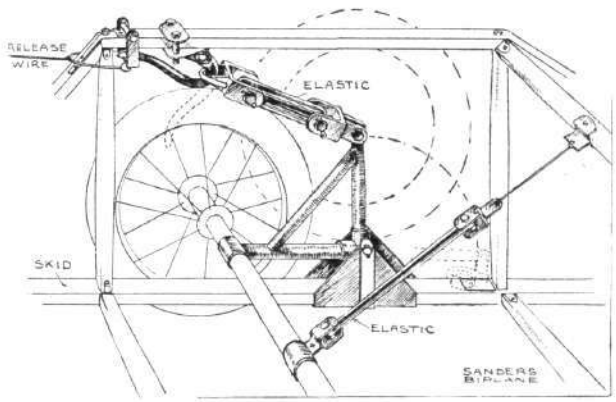
The control levers, pilot's seat, and map case on the Dunne monoplane.

The Dunne "Auto-Safety" monoplane. **"Flight" Copyright.**



The Sanders biplane, showing the downturned extremities of the upper planes, and a view showing how the main planes on the Sanders biplane are hinged in order to temporarily reduce the span.

of its shape. In the Handley Page monoplane, for example, the engine-end of the machine is anything but stream-line like in form, yet there is no better example of stream-line construction at the Show than is provided by the after-part of its body. It has quite a fish-like appearance, and is surfaced throughout in highly-polished three-ply mahogany. As the



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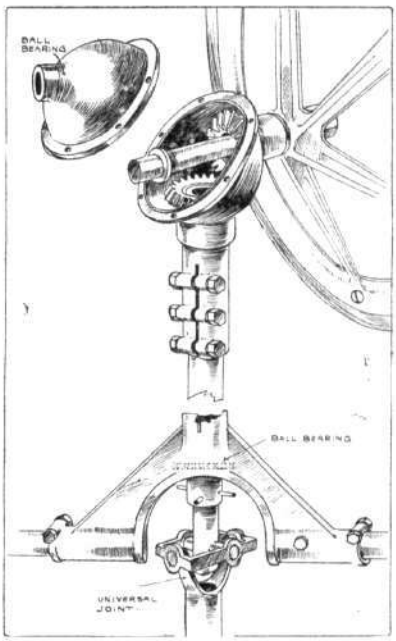
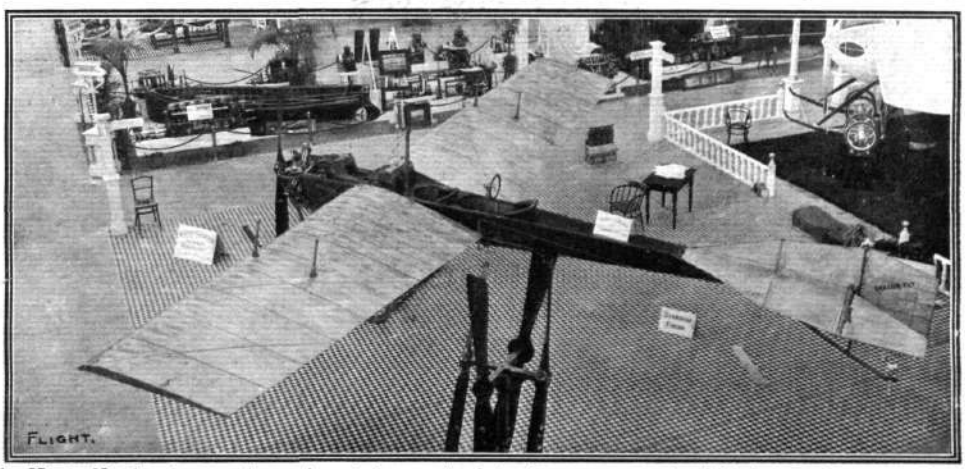
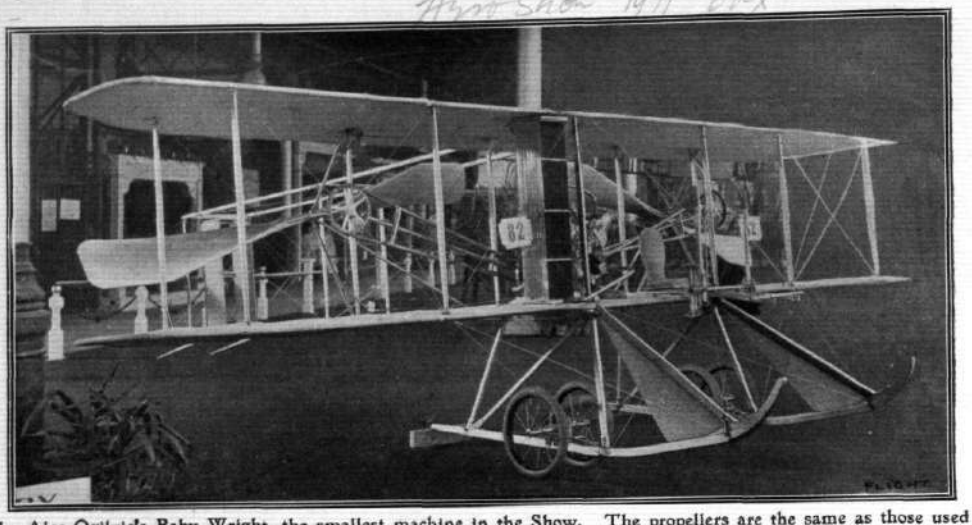
Sketch illustrating the mechanism of the disappearing axle on the Sanders biplane. By releasing a catch the axle and wheels are drawn above the level of the skids, on which latter members the machine can therefore land direct.



The Martin-Handasyde Control Gear.

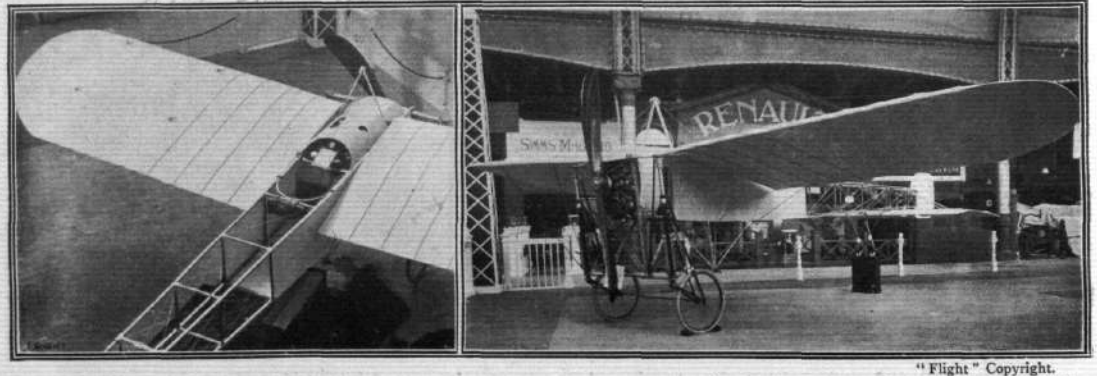


The Martin-Handasyde monoplane. A typical example of the Antoinette type, but full of original detail in design.



Mr. Alec Ogilvie's Baby Wright, the smallest machine in the Show. The propellers are the same as those used on the standard model, and together spread across the full span of the machine. An N.E.C. two-stroke engine is fitted in this model, which is otherwise the same as that with which Mr. Ogilvie competed on behalf of England in the Gordon-Bennett Race.

The Humber biplane, with the sloping panels to give improved lateral stability. These panels can be controlled by wires to steer and balance the machine.



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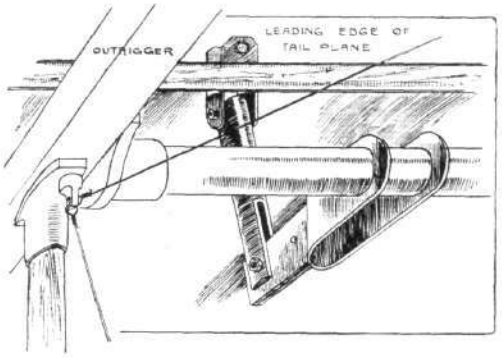
Two views of the latest genuine Blériot monoplane, showing the protective roof over the engine and tank and the partially covered framework.

machine is only designed to carry the pilot, its general lines are characterised by short overall length, and so this particular machine has an uncommonly neat appearance.

More conventional examples of enclosed body-work, in which the surface material is merely laid straight on the frame and forms flat sides are to be seen in the Blériot, Martin-Handasyde, Bristol and Blackburn monoplanes, and, strictly speaking, it is to this latter category that the Nieuport also belongs.



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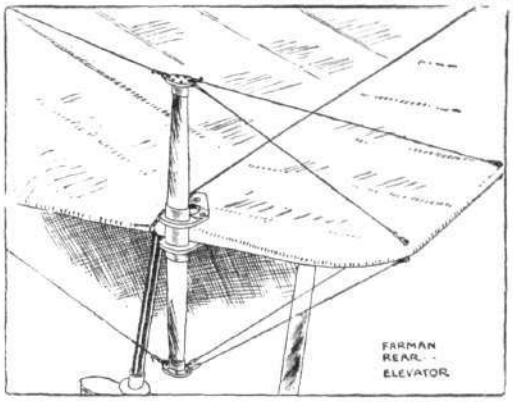
Sketch illustrating how the attitude of the tail is adjusted by a hand wheel on the Sommer-type Humber biplane.

The most interesting development of enclosed body-work is, however, in connection with some of the modern biplanes which hitherto have always been characterised by the entire exposure of all the principal masses. The most important—as it was also one of the earliest examples of this system of construction—is the Breguet biplane, which may be described as having a *monoplane body supporting biplane wings*. The body is completely surfaced from head to tail, and is of great length. Unfortunately it has a most ungainly appearance, owing to a peculiar discontinuity in its lines; but this is, perhaps, more pronounced when the pilot is not on board, because the general shape has been based on the aviator's position in the machine and on the amount that his body projects above the level of the frame. A new type of Bristol biplane, which is now being built in addition to the Farman pattern, is designed on Breguet lines and has the characteristic enclosed body, which, with the single row of struts in the gap and the engine in front, constitute the outstanding features of the Breguet type.

Various other applications of this principle of enclosed body-work to biplane construction are to be found among the modern examples of the Farman type of aeroplane. The Bristol machine of this pattern, made by the British and Colonial Aeroplane Co., has a kind of car for the pilot



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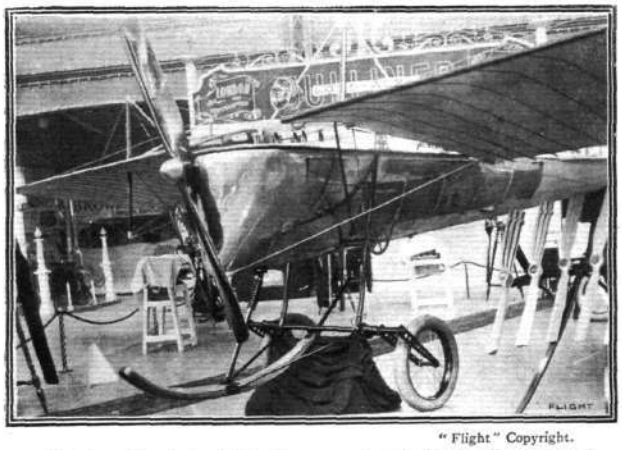
Detail sketch illustrating the rear elevating plane on the Farman biplane.

and passenger, but the engine, being a rotary Gnome, is exposed. On the genuine Maurice Farman, exhibited by the Aeroplane Supply Co., a similar casing extends round the engine also, which in this case is a stationary Renault, with the propeller mounted on the half-speed cam-shaft. On the Grahame-White biplane the pilot and passenger sit in a dainty little gondola. On the Howard Wright the outrigger carrying the foot-rest is covered in underneath and forms a kind of tray, but otherwise everything is exposed as in the original design.

Turning to a consideration of the machines at Olympia from the point of view of their general design, it is interesting to compare them by classification into broader and somewhat more fundamental divisions than results from a mere discussion as to whether they are in the latest mode as regards body construction. There are, as we have mentioned already, twenty machines on view, ten of which are biplanes and ten monoplanes. Of the ten biplanes, five may properly be classified as belonging to the Farman type. These include



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The boat-like body of the Kny aeroplane, built by Mulliner's of Long Acre and Northampton. Apart from this characteristic feature the most important structural detail is the method of swivelling the wings and depressing the leading edge so as to alter their attitude and camber simultaneously.

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View showing the fish-like body on the Handley Page monoplane.

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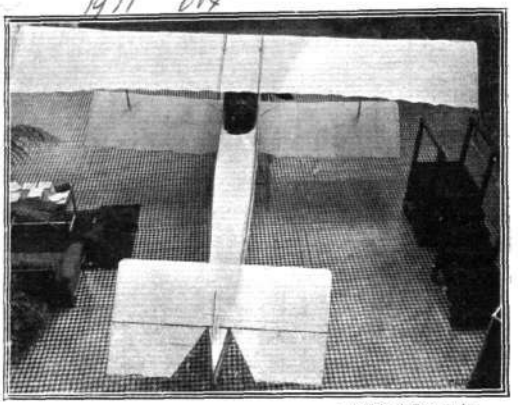
The Breguet biplane, an example of the monoplane-type body applied to biplane construction. The engine is in front, and the entire body is enclosed from head to tail. The passenger sits in front of the pilot, and being approximately on the centre of pressure, his presence does not seriously affect the balance of the machine.



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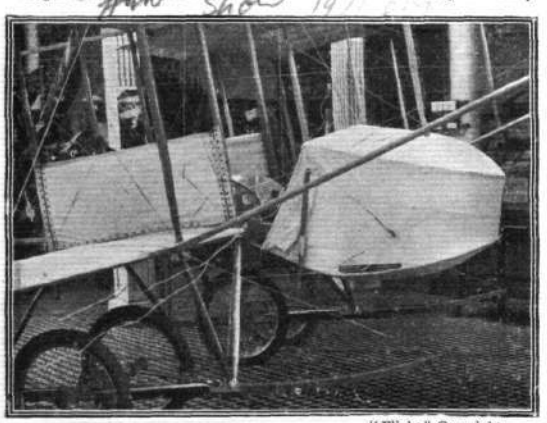
The Bristol biplane of the Breguet type, showing the characteristic enclosed boat body and the single struts separating the upper and lower planes.

the British-built copies by the British and Colonial Aeroplane Co., Messrs. Howard Wright and Messrs. Grahame-White. Each has minor peculiarities of its own, particulars of which will be found on reference to the illustrated descriptions devoted to this and most other leading machines in recent issues of FLIGHT. There is also the Maurice Farman, which differs from the Henry Farman in the flatter appearance of its planes and in the extended skids, which curve up to support the elevator on the Sommer principle. The Sommer type, which may be practically considered as a modification of the Farman design, is represented at Olympia by the Humber biplane. The essential characteristics of the Farman machine, which is unquestionably the most popular aeroplane that has yet been built, are basically that of the original Voisin, from which it was evolved by Henry Farman, who flew the Voisin biplane at a time when he was one of the first men to fly at all. The Farman machine is a biplane with an elevator in front, a tail behind, and the propeller immediately behind the main planes. As the popular type of engine used on this machine is the Gnome rotary, which is always mounted adjacent to the propeller, the principal mass is situated aft of the centre of pressure, and consequently the tail is necessarily of the lifting type because the pilot does not, in the accepted position, balance the engine by his own weight.

On the Breguet biplane, where the relative positions of the engine and pilot are reversed, the tail becomes, practically speaking, a non-lifting member, although in actual practice the tail of the Breguet is a slightly cambered plane. Incidentally, of course, the Breguet system facilitates the use of a monoplane type body, because the propeller, being in front, does not interfere with the continuity of the longitudinal spars in the construction of such a member. The enclosing of the body so as to be more or less of stream-line form, which feature has already been discussed, is, of course, only a natural evolution as the outcome of taking a further step in detail design. While on the subject of the Breguet machine it should also be mentioned that quite apart from the question of type this model belongs to a class apart in any case, because it is constructed entirely of steel—timber being now, as formerly, the standard material for aeroplane framework. The Breguet-type aeroplane made by the British and Colonial Aeroplane Co. is constructed of wood.

Of the three remaining biplanes at Olympia, each belongs to a separate class. There is the small Wright racer, with which type Mr. Alec Ogilvie competed in the Gordon-Bennett race; the Cody biplane, with which Mr. S. F. Cody won the British Michelin Cup; and the Sanders biplane, which, in some essential features, resembles the biplane originally designed by Messrs. Short Bros.

The Wright biplane in its present form is characterised by the absence of any front elevator and by the use of a non-lifting tail. Practically, the machine is in balance about the centre of pressure with the pilot on board, and, indeed, the spiral draught from the propellers is enough to upset this balance through its influence on the tail plane.



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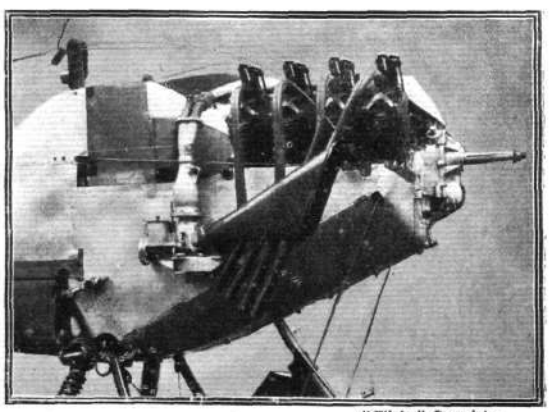
View of the casing which protects the pilot on Grahame-White's "New Baby" biplane. This photo also shows the arrangement of the skids.



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Close view of the prow of the Breguet biplane, showing the very characteristic armour-plated appearance of the body. The entire framework of this machine is made of steel.

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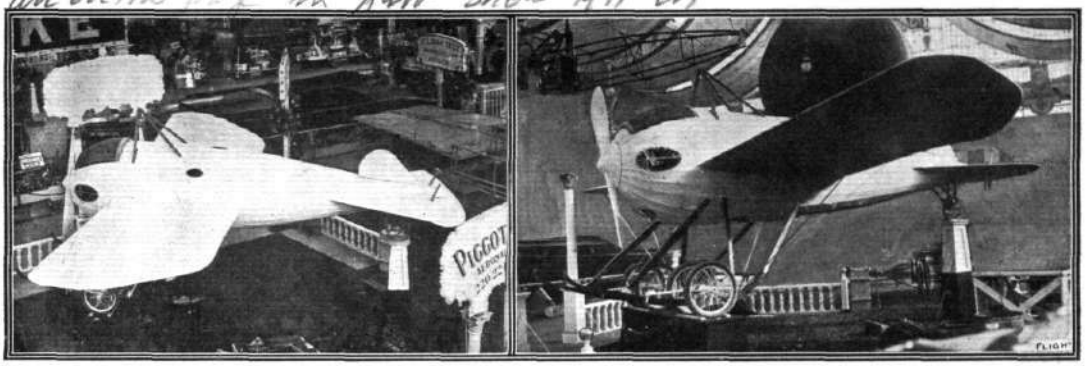

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A pronounced example of the stream-line form body, the Piggott monoplane. The entire framework of this machine is enclosed in a light fabric-covered shell, access to which is obtained from beneath. There is room for pilot and passenger inside, both of whom have an outlook through various small windows. The propeller-boss is conical, and forms a sharp point on the otherwise hemispherical head. The radiator forms a kind of crest above the forehead.

The Cody biplane is similarly a balanced machine, but it differs from the present Wright type in having an elevator. The elevator on the Cody machine is a cambered plane, and normally carries some of the load for convenience in control, although it is not essential from constructional considerations that it should do so. The engine on the Cody biplane is carried on the lower plane, and, within reason, both it and the pilot can have their positions altered in order to effect any degree of balance that may be required. In practice, as has been mentioned, Mr. Cody prefers that the elevator should be loaded a little, as he considers that it facilitates control.

The Sanders aeroplane is fundamentally a modification of the original Wright biplane, as its only tail member is the rudder, and there is an elevator in front. This elevator, however, probably carries proportionately more load than on the original Wright, because the very strong Short type girder under-carriage is probably heavier than the corresponding outrigger on the original Wright machine. These girder skids and the elevator itself are, to all intents and purposes, the same as those on the Short biplane last year. The main planes themselves are characterised by sharply downturned extremities on the upper plane that act as side curtains to prevent leakage and sideslip. The engine and propeller on the Sanders biplane are arranged more or less on the same lines as the Cody—that is to say, the propeller is mounted midway in the gap and is driven at half engine speed by a single vertical chain. The rudder is a triplane, in which respect it differs from the biplane rudder on the Wright.

If we attempt to compare the monoplanes on a similar basis it is somewhat more difficult to differentiate between types, owing mainly to the gradual merging of the characteristics of the Blériot and Antoinette patterns that have hitherto led the field and been distinct. Thus, for instance, the V-section boatlike Antoinette body may be seen combined with Blériot pattern wings, which are certainly quite distinct from the planes of the true Antoinette, both on account of the fact that they are thinner and also by reason of the absence of individual trussing on the wing spars.

A genuine Blériot, with its characteristic lifting tail, rectangular open girder body and rather low set centre of gravity, is exhibited by the London representatives of that firm; while the Martin-Handasyde monoplane may be considered, at any rate as regards its appearance, as characteristic of the real Antoinette. It has the triangular section covered frame, non-lifting tail and individually trussed wing spars. As a design, however, the Martin-Handasyde monoplane is full of original detail.

Machines like the Blackburn and Bristol monoplanes may

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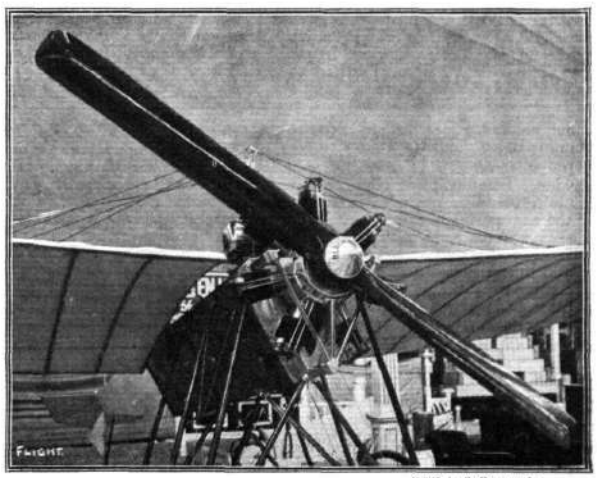
View of the partially finished Cole tandem monoplane, showing one of the wings folded.



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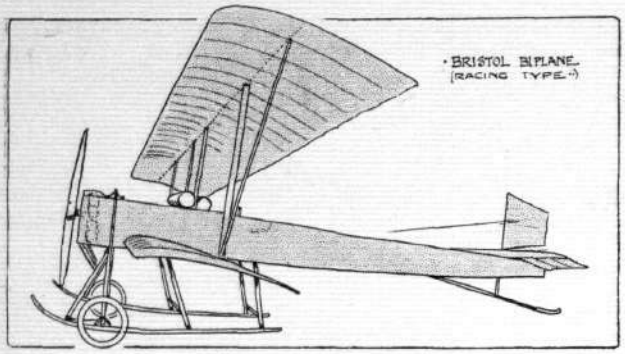
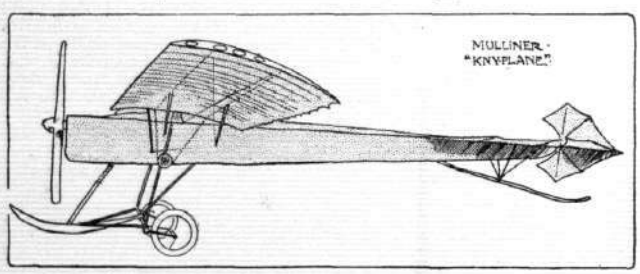
The Isaacson stationary radial engine on the Blackburn monoplane.



be classified as lying between these two distinct types, inasmuch as they have Antoinette bodies with wings that certainly bear more resemblance to the Blériot pattern than the Antoinette, and are, at any rate, trussed only to one central mast.

In the Kny, Piggott, Handley Page and Nieuport monoplanes the body form predominates over all other characteristics, but in the principle of the non-lifting tail they are alike. The Kny has its wing spars individually trussed more or less on the Antoinette principle, but in the other machines mentioned the wing spars are not thus reinforced.

Properly speaking the real distinction in monoplanes of this classification should be drawn between the tail behind and tail first types, and in the latter category the Valkyrie is at present the only example on view. This machine is of essentially British design and construction. It is characterised by a fixed load-carrying leading plane in front of the main plane, which leading plane must not be confused with the movable elevator that is also provided. In the Valkyrie machines the propeller, engine and pilot are likewise all in front of the main plane. In the Antoinette monoplane the

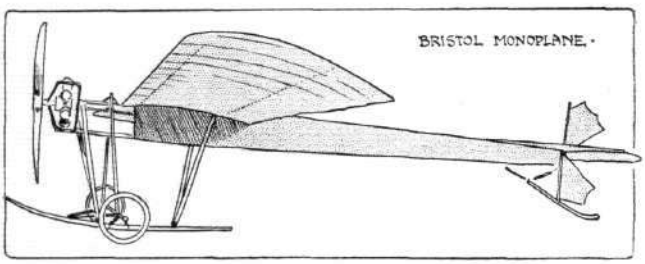


engine and propeller are both appreciably in front of the main plane, and on the Blériot monoplane the engine and propeller are still in front, but distinctly closer to the leading edge. Inasmuch as the central portion of the Valkyrie main plane is recessed to take the propeller, the engine—supposing it to be a Gnome rotary—is not really so much further forward of the leading edge proper than it is on the Antoinette, and thus the essential distinction is more or less confined to the change in the position of the pilot. Appearances are therefore apt to be a little deceptive in respect to the relative distribution of weight with this particular design.

A monoplane that is altogether in a class by itself is the Dunne, which is, so far as practical flying machines are concerned, an evolution of the Dunne biplane. The biplane was in itself, however, originally evolved from still earlier monoplane models. A characteristic feature of this machine is the absence of a tail and the V-plan form of the wings, which also have a varying angle of incidence from root to tip.

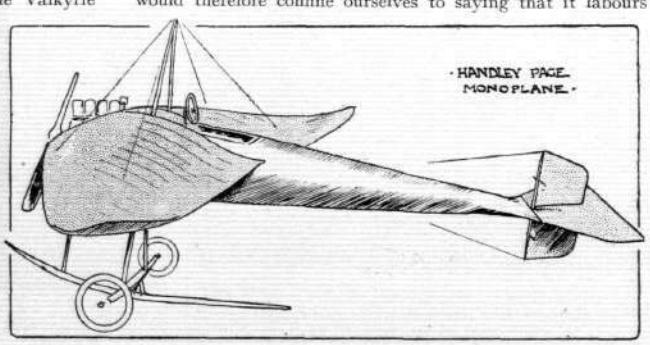
The object of the design is the acquisition of natural stability, and the purpose of sloping back the wings is to acquire an overall length for the machine as distinct from the chord dimension. This increment in length virtually introduces the principle of a tail, and the change in the angle of incidence throughout the succeeding sections of the wings confers the principle of the dihedral angle on the relative attitude of the virtual tail portion in respect to the central leading portion of the machine.

In fundamental principle the Valkyrie appears to be not dissimilar to the Dunne, although there is no structural likeness whatever. The leading plane in the Valkyrie, however, may be likened to the central portion of the Dunne machine, and it makes a dihedral angle in respect to the main plane, the extremities of which correspond to the rearward tips of the Dunne wings. This comparison is, perhaps, not altogether conclusive as thus briefly drawn, but it has been made with the object of emphasising that it is in the underlying principle rather than in the form of the machine that types should be compared on a common scientific basis. The Handley Page monoplane, for example, has

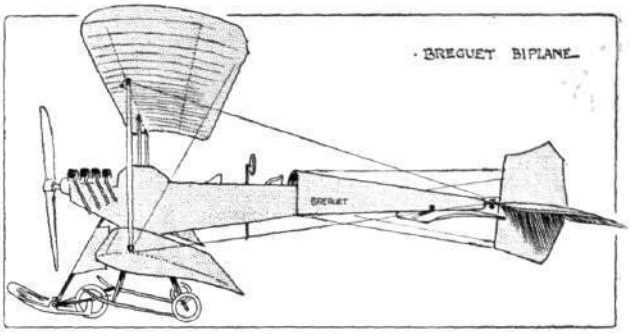


the sloped back wings arranged with a crescent plan form of leading edge, and the dihedral angle is present in a minor degree by the use of upturned flexible wing tips. Apart from the shape of its wings, however, the Dunne monoplane is characterised by its underhung load, the engine and pilot being situated beneath the wings. In the Sanders biplane, which in this respect represents the principle of the early Wright flyer, the elevator may be regarded as a forward tail; but as its attitude can be varied at will, stability is essentially dependent on the action of the pilot.

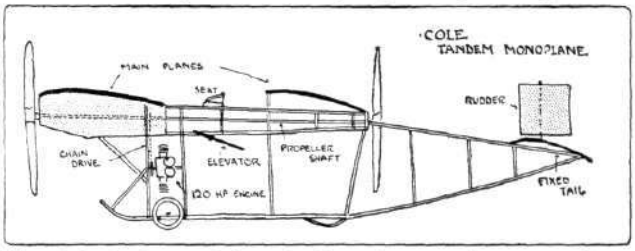
Thus far we have discussed the machines that are already familiar to readers of FLIGHT, and indeed it is one of the most satisfactory features of the present Exhibition that so much of the display is admittedly within the realm of successful practice. No one can possibly say that the present Exhibition lacks originality in aeroplane design, and yet it is singularly free from freaks. Practically the only purely speculative designs are the tandem monoplane exhibited by Messrs. William Cole, and the machine exhibited by Mr. F. L. Bartelt. Of these the former is unfinished, and is thus possibly in some degree exempt from criticism, so we would therefore confine ourselves to saying that it labours



under the disadvantage of having an unprepossessing appearance. The design is due to a Frenchman, M. Magnodex, and attacks a particularly interesting problem in aeroplane construction. The tandem monoplane was on the point of being the first machine to fly in America when Langley was tripped up by ill-fortune in his endeavour to demonstrate a full-sized machine of this type before representatives of the American Government. Langley had succeeded in obtaining very successful flights with large power-driven models, and his construction of a man-carrying aeroplane was undertaken at the instigation of the American Government, as a direct outcome of his previous work. Faulty launching ways twice brought about temporary disaster to the machine, and the authorities, having little faith in those days, withdrew their support. Within a few weeks the Wright Bros. had secretly succeeded where Langley failed, and in the evolution of their machine the tandem monoplane has been forgotten.



The necessity for overall length on a machine as a factor in its stability, and the necessity for providing an adequate body in order to carry the tail, certainly suggest the possibility of developing a useful type in the tandem monoplane since it plausibly offers an opportunity to provide twice the lifting surface for the extra weight of a pair of wings. Whether or no the Cole machine will succeed as the modern prototype of this class we should not like to say. In its present form it certainly seems to us to be following an undesirable principle in attempting to combine such unknown quantities as a tandem monoplane, wooden folding wings, twin propellers, and a new type of rotary engine on the same machine.



The Bartelt machine is something apart from all accepted types. It consists of a steel structure of biplane appearance with loose saggy wing surfaces. The wings are mounted at their shoulders on cranks, whereby they rise and fall, while always remaining parallel to the ground. The motion of the cranks being circular, the wings, simultaneously with their rise and fall, move forwards and backwards—in other words, they perform a modified form of paddle action, the object being to derive support by beating the air. The wing motion is obtained from chain transmission, and in addition to the supporting reaction, there is said to be a propelling force sufficient to keep the machine going without the small propeller that is such a comparatively insignificant constructional feature of the machine as a whole. We are informed that the small scale prototype of the machine exhibited actually flew with a pilot weighing 8 stone 4 lbs.

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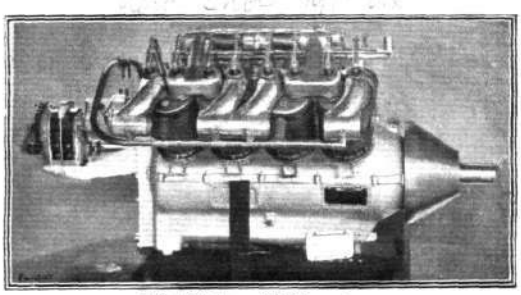
BRITISH ENGINES.

A.B.C. Built in Great Britain by Messrs. the All British (Engine) Co., Ltd., Redbridge Motor Works, Redbridge, Hants.



The 80-h.p. A.B.C. engine.

LEADING particulars of the 40-h.p. A.B.C. engine for aeroplanes :—4 cylinders ; 4¾ in. bore ; 4¾ in. stroke ; four cycle ; water-cooled ; guaranteed to develop 40-h.p. at 1,300 r.p.m. ; fuel consumption, ·6 pint petrol per horse-power hour under above conditions ; weight, 185 lbs., including all accessories (except the radiator, and without fly-wheel).

Characteristic features in design and construction :—

Type.—Vertical.

Cylinders and jackets.—Separate, cast-iron with steel belts, corrugated copper jackets.

Bearings.—Five.

Valves.—Overhead, mechanically operated.

Supplementary exhaust ports.—None.

Carburettor.

Ignition.—Bosch high-tension magneto, single or dual.

Firing intervals in degrees of crank-shaft rotation throughout one complete cycle, 180°.

Lubrication.—Forced feed by gear pump to all bearings.

The 80-h.p. A.B.C. engine :—8 cylinders ; 4¾ in. bore ; 4¾ in. stroke ; four cycle ; water-cooled ; guaranteed to develop 80-h.p. at 1,250 r.p.m. ; fuel consumption, ·65 pint petrol per horse-power hour under above conditions ; weight, 275 lbs., including all accessories (except the radiator, and without fly-wheel).

Characteristic features differing from the 40-h.p. :—

Type.—Vee, 90°.

Firing intervals in degrees of crank-shaft rotation throughout one complete cycle, 90°.

The 120-h.p. A.B.C. engine :—12 cylinders ; 4¾ in. bore ; 4¾ in. stroke ; four cycle ; water cooled ; guaranteed to develop 120-h.p. at 1,250 r.p.m. ; weight, 400 lbs., including all accessories (except the radiator, and without fly-wheel).

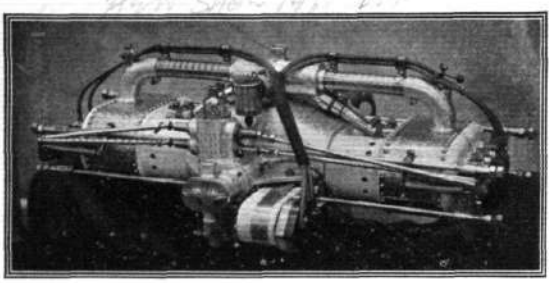
Characteristic features differing from the 40-h.p. :—

Type.—Vee, 90°.

Firing intervals in degrees of crank-shaft rotation throughout one complete cycle, 60°.

Alvaston. Built in Great Britain by Messrs. Alvaston Motors, Ltd., Derby.

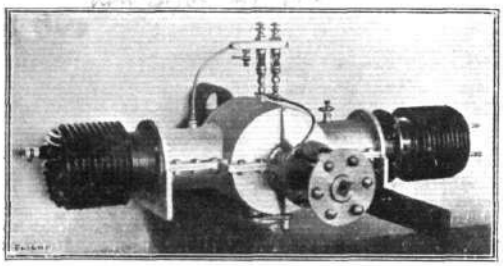
LEADING particulars of the 50-h.p. Alvaston engine for aeroplanes :—4 cylinders ; *114 mm.* bore ; *128 mm.* stroke ; four cycle ; water-cooled ; guaranteed to develop 50-h.p. at 1,200 r.p.m ; fuel consumption, ·7 pint petrol per horse-power hour under above conditions ; weight, 160 lbs., including all accessories (except the radiator).



The 50-h.p. Alvaston.

Characteristic features in design and construction :—
Type.—Horizontal opposed.
Cylinders and jackets.—Cast-iron with copper jackets.
Bearings.—White metal, cam-shaft on balls.
Valves.—Mechanical, all in cylinder heads : overhead rock-shaft.
Supplementary exhaust ports.—Optional.
Carburettor.—Alvaston, float feed.
Ignition.—Simms magneto.
Firing intervals in degrees of crank-shaft rotation throughout one complete cycle, 180°.
Lubrication.—Forced by plunger pump to hollow crank-shaft ; leakage oil thrown up on to cylinder walls.
The 30-h.p. Alvaston engine :—2 cylinders ; 132 mm. bore ; 127 mm. stroke ; four cycle ; water-cooled ; guaranteed to develop 30-h.p. at 1,200 r.p.m. for 3 hours ; fuel consumption, ·7 pint petrol per horse-power hour under above conditions ; weight, 120 lbs., including all accessories (except the radiator).
The 20-h.p. Alvaston engine :—2 cylinders ; 114 mm. bore ; 114 mm. stroke ; four cycle ; water-cooled ; guaranteed to develop 20-h.p. at 1,200 r.p.m. for 3 hours ; fuel consumption, ·7 pint petrol per horse-power hour under above conditions ; weight, 95 lbs., including all accessories (except the radiator).

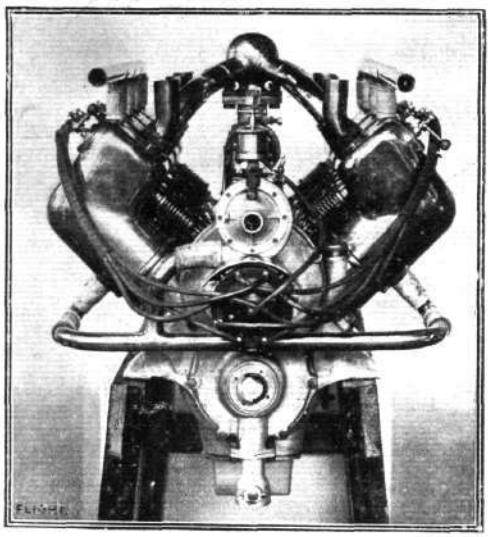
Edwards. Built in Great Britain by Messrs. H. W. Cowley and Co., Ltd., Bella Street, Daubhill, Bolton.



The 15-h.p. Edwards Engine.

LEADING particulars of the 15-h.p. Edwards engine for aeroplanes :—2 cylinders ; 102 mm. bore ; 127 mm. stroke ; two cycle ; air-cooled ; fuel consumption, ¾ pint petrol per horse-power hour under above conditions ; weight, 90 lbs., including all accessories (except the radiator).
Characteristic features in design and construction :—
Type.—Horizontal opposed.
Cylinders and jackets.—Cast-iron, gilled.
Bearings.—White metal.
Valves.—One inlet valve to crank-case.
Supplementary exhaust ports.—In cylinder walls.
Carburettor.—Float feed.
Ignition.—Magneto or battery.
Firing intervals in degrees of crank-shaft rotation throughout one complete cycle, 180°.
Lubrication.—Forced to crank-case, splash to cylinders.
The 30-h.p. Edwards engine for aeroplanes :—4 cylinders ; 102 mm. bore ; 127 mm. stroke ; two cycle ; air-cooled ; fuel consumption, ¾ pint petrol per horse-power hour under above conditions ; weight, 180 lbs., including all accessories (except the radiator).
Characteristic features in design and construction differing from the 15-h.p. :—
Firing intervals in degrees of crank-shaft rotation throughout one complete cycle, 90°.
The 45-h.p. Edwards engine :—6 cylinders ; 102 mm. bore ; 127 mm. stroke ; two cycle ; air-cooled ; guaranteed to develop 45-h.p. at 1,000 r.p.m. ; fuel consumption, ¾ pint petrol per horse-power hour under above conditions.
Characteristic features differing from the 15-h.p. :—
Firing intervals in degrees of crank-shaft rotation throughout one complete cycle, 60°.
The 60-h.p. Edwards engine :—8 cylinders ; 102 mm. bore ; 127 mm. stroke ; two cycle ; air-cooled ; fuel consumption, ¾ pint petrol per horse-power hour under above conditions.
Characteristic features differing from the 15-h.p. :—
Firing intervals in degrees of crank-shaft rotation throughout one complete cycle, 45°.

E.N.V. Built in Great Britain by Messrs. the E.N.V. Motor Synd., Ltd., 4, Hythe Road, Willesden, N.W.



The 60-h.p. E.N.V.

LEADING particulars of the 35-h.p. E.N.V. engine for aeroplanes :—8 cylinders ; 85 mm. bore ; 90 mm. stroke ; four cycle ; water-cooled ; guaranteed to develop 35-h.p. at 1,260 r.p.m. for 3 hours ; fuel consumption, ·6 pint petrol per horse-power hour under above conditions ; weight, 166 lbs. including all accessories (except the radiator).
Characteristic features in design and construction :—
Type.—Vee, 90°.
Cylinders and jackets.—Cast-iron, with electrolytically deposited copper jackets.
Bearings.—Six ball bearings, with double thrust ball bearing.
Valves.—At the side, mechanically operated.
Supplementary exhaust ports.—None.
Carburettor.—Zenith.
Ignition.—Magneto.
Firing intervals in degrees of crank-shaft rotation throughout one complete cycle, 90°.
Lubrication.—Forced feed by pump operated from an eccentric on the crank-shaft.
The 60-h.p. E.N.V. engine :—8 cylinders ; 105 mm. bore ; 110 mm. stroke ; four cycle ; water-cooled ; guaranteed to develop 60-h.p. at 1,120 r.p.m. for 4 hours ; fuel consumption, ·6 pint petrol per horse-power hour under above conditions ; weight, 310 lbs., including all accessories (except the radiator),
N.B.—By test, certified by Mr. Mervyn O'Gorman,

March 17th, 1911, this engine developed 64-b.h.p. for 5 hours on a consumption of ·57 pint of petrol per horse-power hour, and ·1718 pint of oil per horse-power hour. Weight of engine, 337 lbs.; temperature of cooling water, 40° C.

Characteristic features differing from the 35-h.p. :—

Carburettor.—White and Poppe.

The 100-h.p. E.N.V. engine for aeroplanes or dirigibles :—8 cylinders; 130 mm. bore; 150 mm. stroke; four cycle; water-cooled; guaranteed to develop 100-h.p. at 1,000 r.p.m. for 6 hours; fuel consumption, ·8 pint petrol per horse-power hour under above conditions; weight, 525 lbs., including all accessories (except the radiator).

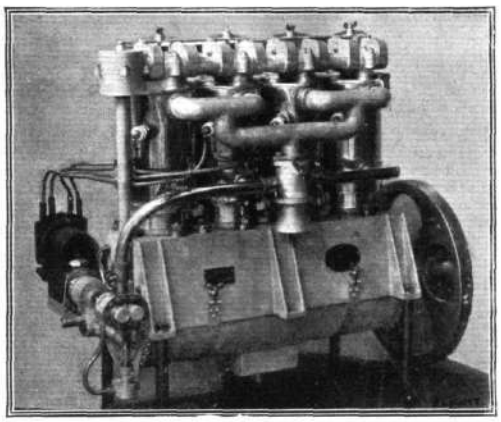
Characteristic features differing from the 35-h.p. :—

Cylinders and jackets.—Steel, with electrolytically deposited copper water-jackets.

Valves.—All overhead and mechanically operated.

Carburettor.—White and Poppe.

Green. Built in Great Britain by Messrs. Green's Motor Patents Syn., Ltd., 55, Berners Street, London, W.



The 30-35-h.p. Green.

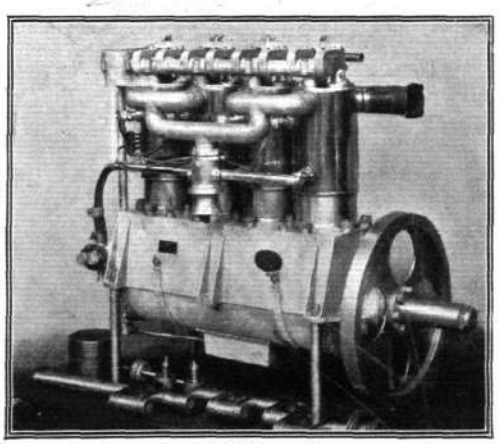
LEADING particulars of the 30–35-h.p. Green engine for aeroplanes :—4 cylinders; 105 mm. bore; 120 mm. stroke; four cycle; water-cooled; guaranteed to develop 30-h.p. at 1,100 r.p.m. for 3 hours; fuel consumption, ·575 pint petrol per horse-power hour under above conditions; weight, 193 lbs., including all accessories (except the radiator).

Characteristic features in design and construction :—

Type.—Vertical.

Cylinders.—Steel, with detachable copper jackets.

Bearings.—White metal.



The 50-60-h.p. Green.

Valves.—Overhead, operated by overhead cam-shaft enclosed in oil bath.

Supplementary exhaust ports.—None.

Carburettor.—Green, non-float.

Ignition.—Magneto, single or dual.

Firing intervals in degrees of crank-shaft rotation throughout one complete cycle, 180°.

Lubrication.—Forced feed to crank-shaft bearings and big ends; splash to gudgeons and pistons; valve mechanism in an oil bath.

The 50–60-h.p. Green engine :—4 cylinders; 140 mm. bore; 146 mm. stroke; four cycle; water-cooled; guaranteed to develop 50-h.p. at 1,050 r.p.m. for 3 hours; fuel consumption, ·8 pint petrol per horse-power hour under above conditions; weight, 310 lbs., including all accessories (except the radiator).

Characteristic features differing from the 30–35-h.p. :—

Supplementary exhaust ports provided if desired. Five 10 mm. holes to each cylinder increases power to 80-h.p.

Carburettor.—Green, non-float.

Isaacson. Built in England by Messrs. the Isaacson Engine Co., Boyne Works, Leeds.

The Isaacson Engine.

LEADING particulars of the 50-h.p. Isaacson engine for aeroplanes :—7 cylinders; 90 mm. bore; 115 mm. stroke; four cycle; air-cooled; guaranteed to develop 50-h.p. at 800 r.p.m. for no limit in hours; fuel consumption, ·48 pint petrol per horse-power hour under above conditions; weight, 195 lbs., including all accessories (except the radiator).

Characteristic features in design and construction :—

Type.—Stationary radial, with two-to-one gear reduction mechanism for driving the propeller, which is mounted concentrically with the crank-shaft.

Cylinders and jackets.—Cast-iron, gilled.

Bearings.—Ball.

Valves.—All overhead and mechanically operated.

Supplementary exhaust ports.—None.

Carburettor.—White and Poppe.

Ignition.—Bosch magneto, with concentric distributor on engine and no loose wiring.

Firing intervals in degrees of crank-shaft rotation throughout one complete cycle 102·8°.

Lubrication.—Forced feed by pump; 1·1 pints of oil per hour.

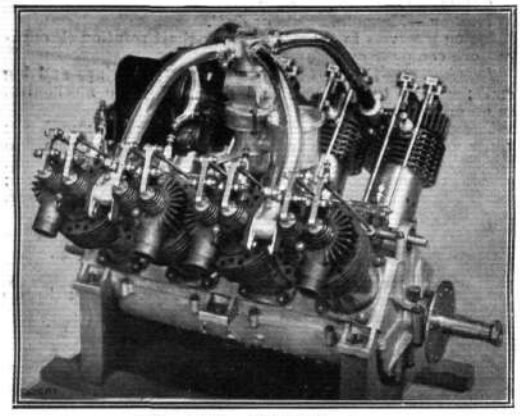
The 100-h.p. Isaacson engine :—14 cylinders; 90 mm. bore; 115 mm. stroke; four cycle; air-cooled; guaranteed to develop 100-h.p. at 800 r.p.m. for no limit in hours; fuel consumption, ·48 pint petrol per horse-power hour under above conditions; weight, 290 lbs., including all accessories (except the radiator).

Characteristic features differing from the 50-h.p. :—

Firing intervals in degrees of crank-shaft rotation throughout one complete cycle 51·4°.

Lubrication.—2·7 pints of oil per hour.

J.A.P. Built in Great Britain by Messrs. John A. Prestwich and Co., Lansdowne Road, Tottenham, N.



The 35-h.p. J.A.P. Engine.

LEADING particulars of the 20-h.p. J.A.P. engine or aeroplanes :—4 cylinders ; 85 mm. bore ; 110 mm. stroke ; 4 cycle ; air cooled ; guaranteed to develop 24-h.p. at 1,800 r.p.m. ; fuel consumption, ·6 pint petrol per horse-power hour under above conditions ; weight, 120 lbs., including all accessories (except the radiator).

Characteristic features in design and construction :—

Type.—Vee.

Cylinders and jackets.—Separate, cast-iron, gilled.

Bearings.—Three, white metal, cam-shaft on ball bearings, connecting-rod big-ends have ball bearings.

Valves.—Mechanical, at the side.

Carburettor.—J.A.P.

Ignition.—Magneto.

Firing intervals in degrees of crank-shaft rotation throughout one complete cycle, 180°.

The 35-h.p. J.A.P. engine :—8 cylinders ; 85 mm. bore ; 95 mm. stroke ; 4 cycle ; air-cooled ; guaranteed to develop 40-h.p. at 1,800 r.p.m. ; fuel consumption, ·6 pint petrol per horse-power hour under above conditions ; weight, 200 lbs., including all accessories (except the radiator).

Characteristic features differing from the 20-h.p. :—

Bearings.—Five.

Valves.—All overhead, mechanically operated.

Firing intervals in degrees of crank-shaft rotation throughout one complete cycle, 90°.

The 40-h.p. J.A.P. engine :—8 cylinders ; 85 mm. bore ; 110 mm. stroke ; 4 cycle ; air-cooled ; guaranteed to develop 40-h.p. at 1,800 r.p.m. ; fuel consumption, ·6 pint petrol per horse-power hour under above conditions ; weight, 200 lbs. including all accessories (except the radiator).

Characteristic features differing from the 20-h.p.

Bearings.—Five.

Valves.—At the side, mechanically operated.

Firing intervals in degrees of crank-shaft rotation throughout one complete cycle, 90°.

Lamplough. Built in Great Britain by Messrs. Lamplough and Son, Ltd., Willesden Junction.

LEADING particulars of the 102-h.p. Lamplough engine for aeroplanes :—6 cylinders ; 4 in. bore ; 2½ in. stroke ; 2 cycle ; air cooled ; guaranteed to develop 102-h.p. at 1,000 r.p.m. for no limit hours ; weight, 300 lbs., including all accessories (except the radiator).

Characteristic features in design and construction :—

Type.—Horizontal rotary cylinders, radial 2 stroke with blower.

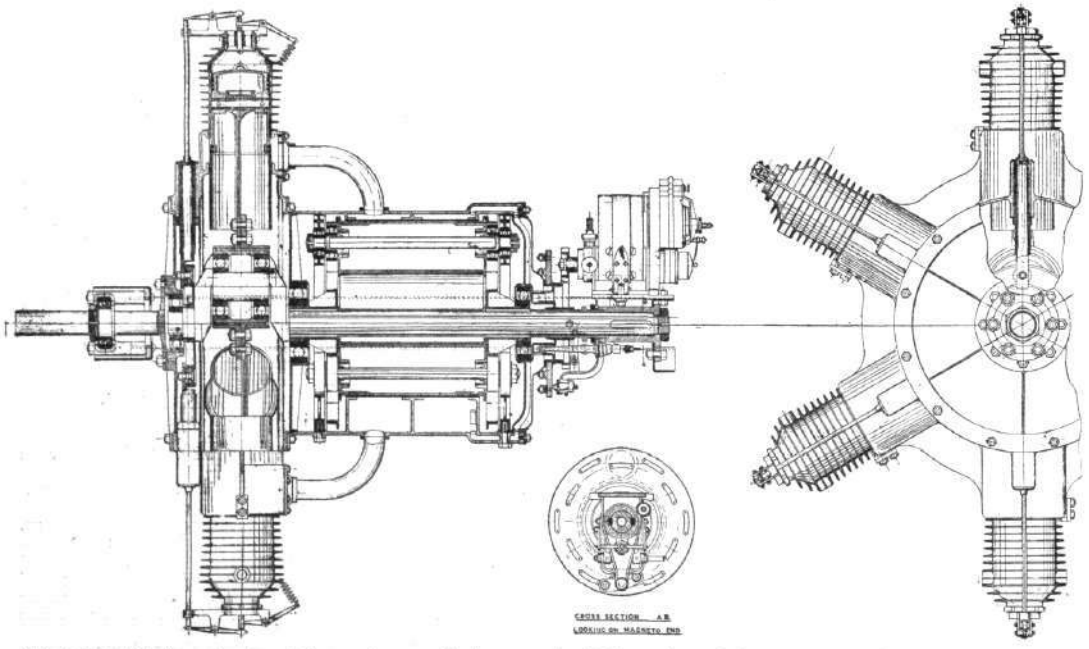
Cylinders and jackets.—Steel castings, gilled.

Bearings.—Ball.

Valves.—Six exhaust only, inlet by ports.

Supplementary exhaust ports.—None. *Ignition.*—Dual, Bosch.

Firing intervals in degrees of crank-shaft rotation throughout one complete cycle, 30°. *Lubrication.*—Forced.



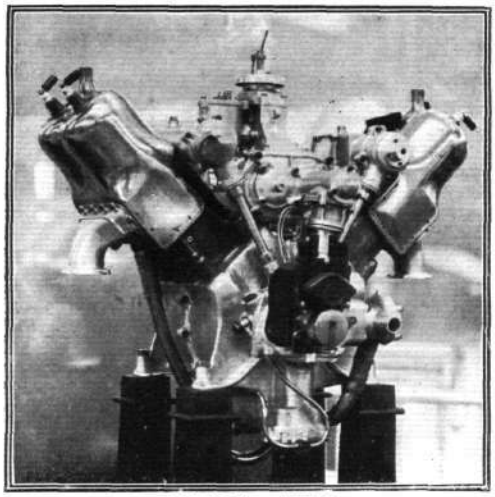
The all-British Lamplough aviation motor, special features of which are the radial arrangement of the six revolving two-stroke cylinders of 4 ins. bore by 2½ ins. stroke, and the employment of a blower to feed them with explosive mixture through ports uncovered by their pistons, while the mushroom exhaust-valves are mounted in the heads of the combustion-chambers, where they are actuated by push-rods and pivoted levers.

"Flight" Copyright.

The latest Lamplough rotary engine.

N.E.C. Built in Great Britain by Messrs. the New Engine (Motor) Co., 9, Grafton Street, Bond Street, W.

LEADING particulars of the 50-h.p. N.E.C engine for aeroplanes :—4 cylinders ; $3\frac{11}{16}$ in. bore ; $4\frac{1}{2}$ in. stroke ; two cycle ; water-cooled ; guaranteed to develop 50-h.p. at 1,250 r.p.m. for no limit ; weight, 150 lbs., including all accessories (except the radiator).



The 50-h.p. N.E.C.

Characteristic features in design and construction :—

Type.—Vee, with rotary admission valves regulating the admission of scavenging air and gas, which are forced into the cylinders by Roots blowers.

Cylinders and jackets.—Cast-iron, with electrolytically deposited copper jackets. *Bearings.*—White metal.

Valves.—None, other than the rotating mechanism that distinguishes the N.E.C. motor from others of the two-stroke type.

Supplementary exhaust ports.—None. *Carburettor.*—N.E.C. *Ignition.*—Eisemann magneto.

Firing intervals in degrees of crank-shaft rotation throughout one complete cycle, 90°.

Lubrication.—Forced to all bearings.

Wolseley. Built in Great Britain by Messrs. the Wolseley Co., Birmingham, and York Street, Westminster.

LEADING particulars of the 60-h.p. Wolseley engine for aeroplanes :—8 cylinders ; $3\frac{3}{4}$ in. bore ; $5\frac{1}{2}$ in. stroke ; four cycle ; water-cooled ; guaranteed to develop 60-h.p. at 1,200 r.p.m. for 4 hours ; fuel consumption, ·75 pint petrol per horse-power hour under above conditions ; weight, 300 lbs., including all accessories (except the radiator).

The 60-h.p. Wolseley.

Characteristic features in design and construction :—

Type.—Vee, 90°.

Cylinders and jackets.—Separate, steel walls, cast heads, aluminium jackets, steel pistons. *Bearings.*—Three.

Valves.—All overhead, atmospheric inlet, mech. exhaust.

Carburettor.—Wolseley annular float. *Ignition.*—Bosch dual.

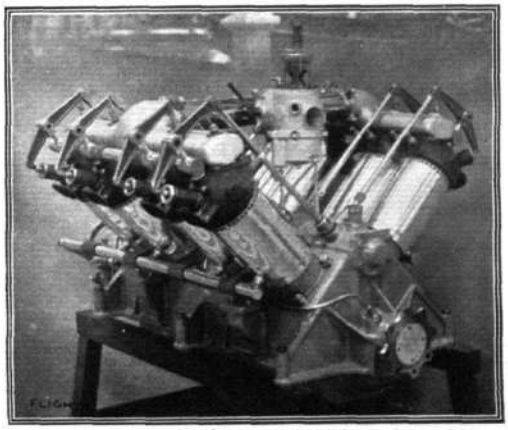
Firing intervals in degrees of crank-shaft rotation throughout one complete cycle, 90°.

Lubrication.—Forced by two rotary pumps in tandem. One pump draws the oil from the tank and forces it to the bearings ; the other withdraws the oil from the sump and returns it to the tank.

The 120-h.p. Wolseley engine for aeroplanes and dirigibles ; 8 cylinders ; 5 in. bore ; 7 in. stroke ; four cycle ; water-cooled ; guaranteed to develop 120-h.p. at 1,200 r.p.m. for 4 hours ; fuel consumption, ·75 pint petrol per horse-power hour under above conditions ; weight, 580 lbs., including all accessories (except the radiator).

Characteristic features differing from the 60-h.p. :—

Valves.—Both overhead and mechanically operated.



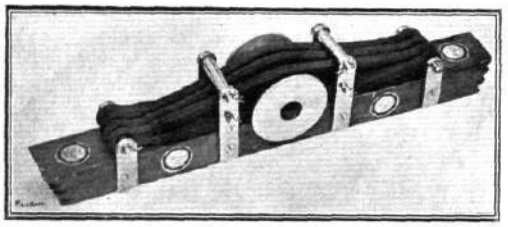
The 120-h.p. Wolseley.

OLYMPIA·1911

ROUND THE ACCESSORY STANDS.

WITH accessories of all kinds the Show is replete, and although there are few innovations of a startling character, we endeavour to give, in the following article, particulars of some which should prove of particular interest. Some of these and other ingenious devices will, however, be dealt with more fully in later issues.

"Asco" specialities are so well known that they hardly need description, but one of them that is of particular interest is an improved Farman type shock-absorber named the "Flexten." This has eight elastic cords, of the "Whiteley Exerciser" type, which pass over the axle and are secured to the skids by two steel bands in the usual way. The feature of this absorber is that on each side of the axle—between the



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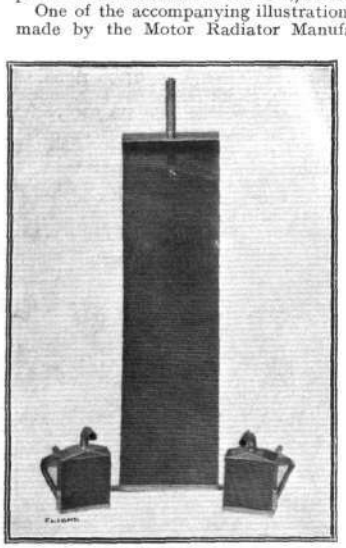
The Aeroplane Supply Co.'s "Flexten" rubber shock-absorber, for Farman-pattern landing-chassis.

atter and the steel bands that secure the elastic cords to the skid—is another band fixed to the skid and having two rollers, under which the elastic cord is passed. By this arrangement, although a long length of elastic is used, the rising of the wheels when they come into contact with some obstruction is slow and smooth, and it is claimed that side oscillation is entirely obviated. The cords consist of a continuous length of fabric-covered elastic, being made up of numerous square section rubber strands. The approximate pull of these absorbers is about 1,700 lbs. for a rise of 10 ins.

One of the accompanying illustrations shows the radiators made by the Motor Radiator Manufacturing Co. for Mr. S. F. Cody, and exhibited by them on Stand 8. One of the features of Mr. Cody's machine is the provision of foot-warmers, in addition to the ordinary radiator, which, by the way, is intentionally placed just in front of the pilot. They are of fine workmanship and are very light. Perhaps one of the most interesting exhibits in the whole Show is to be seen on this stand. It is a device for condensing the exhaust gases of the engine so as to manufacture liquid ballast that will replace the weight of petrol consumed. We hope to deal more fully with this subject at a later date, but for the present it may be



"Flight" Copyright.

S. F. Cody's new Zimmermann radiators, made by the Motor Radiator Manufacturing Co.

noted that the machine shown has actually been in use on a Zeppelin airship for some time, and is reported to have given excellent results.

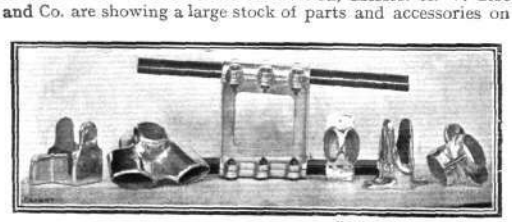
Messrs. Rubery Owen are well known to our readers in connection with pressed and welded steelwork, and they also manufacture a very large assortment of solid cold-drawn steel tubes of various sections. One of their lines is the manufacture of pressed steel engine bearers in various patterns for almost any engine or machine. Mention should be made of the wire tighteners and eyebolts and tinned wire, of which this firm also make a speciality. The wire tighteners are made out of one solid piece of steel, some of the central portion being cut away so as to expose to view the threaded bolts. Another wire tightener that is rather interesting consists of a cylindrical body, the pins working within the latter being fitted with springs and adjustable nuts, so that the pins—to which the wires are attached—"give" when certain tensions are reached.

On Stand 13 Messrs. M'Lean, M'Lean & Co., of Ardrossan, show silk oilskins and samples of materials and aero fabrics. The oilskins, which are remarkable for their extreme lightness, are quite free from stickiness, and are made from selected Jap silk. A full-sized coat weighs only about 10 ozs., and can with ease be folded to go in the pocket. One would expect such garments to be very expensive, but taking into consideration their utility the price charged is extremely reasonable.

A very interesting acetylene searchlight made by Blériot is to be seen on the Imperial Motor Industries, Ltd., Stand No. 15. This is made of aluminium, and is very light, although designed to withstand hard usage. Amongst other exhibits by this firm are the well-known R.W.F. ball bearings, and ignition specialities.

The Mossley Hill Motor Car Works are the agents for the well-known Zenith carburettor, which it is hardly necessary for us to describe here, as it has been so fully illustrated in the *Auto*. Extra light types are specially made for use on aeroplanes and airships. These are made entirely of aluminium and in three sizes, the smallest size weighing 2 lbs. 5 ozs., the largest one being only a few ounces heavier.

Although the "Avroplane"—which is described elsewhere in this issue—is not at the Exhibition, Messrs. A. V. Roe and Co. are showing a large stock of parts and accessories on



"Flight" Copyright.

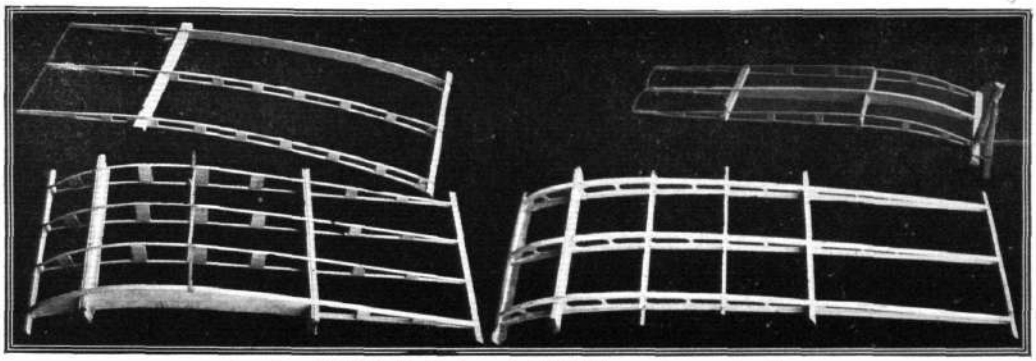
A few of A. V. Roe and Co.'s aluminium lugs and sockets.

their Stand 29. Perhaps the most interesting of these is the very varied assortment of aluminium lugs and sockets.

Very excellent work is put into the wing construction turned out by T. W. K. Clarke, of Kingston. The best quality woods only are employed, and our illustrations give an idea of their construction and finish. In some cases the main spars are of built-up "I" section, and the ribs are thin laths with wooden distance pieces spaced at intervals between them. In another type the space between the top and bottom rib is filled by thin pieces of wood cut to the correct curvature, and sometimes with pieces cut out for lightness.

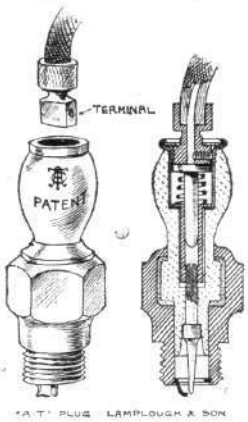
A large selection of precision instruments by Hüe Frères is shown by the General Aviation Contract Co. on Stand No. 19. Among others may be mentioned a recording altimeter, the "Vigilax" automatic statoscope, and a special altimeter designed to meet the requirements of the Aero Club de France. This can be sealed by a silk thread, and by this means it becomes impossible for it to be tampered with while in the air.

Among other very interesting instruments may be men-



Samples of T. W. K. Clarke and Co.'s built-up wing construction.

tioned an "Ascent and Descent" altimeter, which by means of three dials gives three separate readings from the same needle. The inner dial is graduated as an ordinary barometer, the next has altimetric divisions, while the outer one gives ascent and descent readings. The two outer dials can be set opposite the needle by means of milled nuts, thus making all allowance for differences in pressure. Of course, the chief items of interest on this stand are the Dansette-Gillet engine, and the exhibit of Regy Frères (R.F.) propellers.



"A.T." PLUG. LAMPLOUGH & SON.

Sketch of the Lamplough Auto-Terminal" plug.—The terminal is pushed down into the slot and given a quarter turn, and when released rises into its locking position.

Lamplough and Son, who make the well-known radiators bearing their name, also supply an extremely ingenious sparking plug, named the "Auto-Terminal" plug. It is claimed for this plug that it cannot become disconnected through vibration or otherwise. It cannot be taken apart, being built up and adjusted by the manufacturers. Thus there is little possibility of it being thrown out of adjustment and it therefore stands a lot of rough usage.

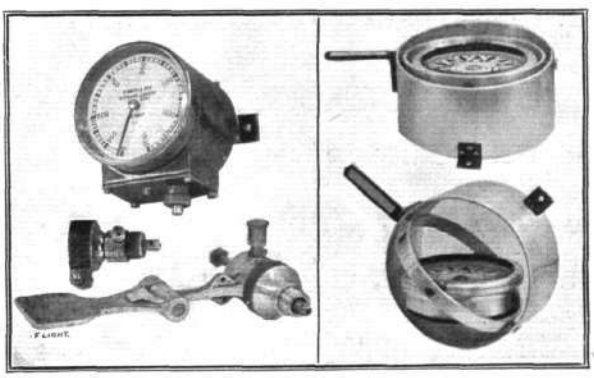
No aeroplane shed is complete without a lathe, for occasions are continually arising when the use of this is absolutely essential, whether it be for repair work or the actual construction of a machine. Amongst the numerous sizes and types of lathes which Messrs. Drummond Bros. of Guildford, supply, is one which is especially applicable to the aeroplane shed. This is a compact 3½ in. centre self-acting sliding, boring and screw-cutting machine. The length admitted between the centres is 1 ft. 4 ins., and the length of the bed is 2 ft. 6 ins. This and other interesting tools are exhibited by the makers on Stand 106. Messrs. Melhuish and Sons also have a fine selection of machine tools on their stand.

The Electric and Ordnance Accessories Co., Ltd. (Vickers, Sons and Maxim), Stand 90, are showing sample machine parts made of the new metal Duralumin, of which general particulars have already been given in these pages. This metal is now made up in almost any form, but is not recommended for castings. In addition to its use for small articles, it is now being tested in more important objects, as for instance brake-levers and connecting-rods for cars; while we understand it is also proposed to use it for the framework of chassis.

On this stand also is shown the Hall-Eoa dual ignition system, one of the remarkable points of which is the extreme accessibility of the magneto.

S. Smith and Son show their usual well-known speedometers and revolution counters, one of the latter being interesting on account of the fact that, although it is driven from the cam-shaft by an ingenious clip-fastening shown in one of the accompanying illustrations, the dial is calibrated to show the speed of the crank-shaft. Messrs. Smith also show a luminous liquid compass specially designed for aeroplane work, and so made that the rim of the outside box can be turned until the required bearing coincides with the direction required. All that is then necessary by night or by day is to keep the luminous point denoting N on the needle card against the luminous index on the rim. There is, in addition, a pointer mounted on the outside of the frame which points in the direction the machine is going.

Henry Hughes and Son also have a new liquid compass, which is suitable for use on dirigibles or aeroplanes. The card and needles of the compass are mounted in such a manner as to free them from the dragging effects of the liquid, and to come quickly to rest after any deflection and without oscillation. A lever can be worked from the bottom of the instrument to lift and clamp the card off the centre when not in use. By far the most interesting feature of this compass is the course pointer on the top of the card. When the latter is lifted off its centre a small arm can be worked from the top of the compass to turn this pointer to any point on the card, and there it remains until a new course is set. A small segment of transparent material with a white space in the centre, and red and blue arcs on each side, moves with the pointer, and at night is illuminated from below by a small electric lamp. When on the correct course the white light will show, while the red and blue give warning at once of any deviation.



Two views of S. Smith and Son's aviation specialities, showing on the right their new luminous liquid compass, and on the left the engine revolution-indicator and connections. Underneath the indicator is seen the aluminium arm which, when necessary, forms a support for the flexible shafting.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

Committee Meeting.

A MEETING of the Committee was held on Tuesday, the 28th March, 1911, when there were present :—Mr. R. W. Wallace, K.C., in the chair, Mr. Griffith Brewer, Mr. Ernest C. Bucknall, Col. H. C. L. Holden, R.A., F.R.S., Prof. A. K. Huntington, Mr. C. F. Pollock, Mr. Stanley Spooner, Hon. A. Stanley, M.P., and Harold E. Perrin, Secretary.

New Members.—The following new members were elected :—Robert Francis Macfie, George Norman Ogilvie, Capt. Maurice Loraine Pears, and Gustav P. Stollwerck.

Statue of Liberty Protest.—The following Sub-Committee was appointed to prepare the case to be submitted to the Federation :—Griffith Brewer, V. Ker-Seymer, C. F. Pollock, and Stanley Spooner.

Competitors' Register.

The Royal Aero Club has opened a Competitors' Register, and certified aviators of British nationality may have their names inscribed on the register free of charge on making application.

Annual General Meeting.

The Annual General Meeting was held on Thursday last, March 30th, 1911, and a full report will appear in the next issue of FLIGHT.

Gordon-Bennett Aviation Cup.

The date for the contest has now been fixed for Saturday, July 1st, 1911.

The following countries have entered for the Gordon-Bennett Aviation Cup :—

America.	France.	Great Britain.
Austria.	Germany.	

Each country will be represented by three competitors.

In order to give as much time as possible, the Royal Aero Club has extended the date of entry for the British competitors to May 1st, 1911. Intending competitors are requested to notify the Secretary of the Royal Aero Club on or before that date, of their willingness to compete, if chosen. Entries must be accompanied by a remittance of £20, which amount will be returned should the entrant not be selected.

British Empire Michelin Cup No. 2.

(Under the rules of the Royal Aero Club and the Federation Aeronautique Internationale.)

The Michelin Tyre Company has presented to the Royal Aero Club of the United Kingdom for competition by British aviators, the sum of £1,800 divided into three yearly awards, as follows :—

£400 for the year 1911,
£600 ,, 1912,
£800 ,, 1913,

to which will be added a trophy each year, to be retained by the winner.

The following are the rules governing the competition for the year 1911 :—

1. The winner for the year 1911 shall be the competitor who, on October 15th, 1911, shall have completed a prescribed circuit of about 125 miles on an aeroplane in flight in the fastest time, reckoned in miles per hour.

2. A competitor may make his flight round any one of the following circuits :—

1.	2.	3.	4.
Eastchurch.	Hendon.	Brooklands.	Amesbury.
Brooklands.	Bedford.	Hendon.	Swindon.
Hendon.	Huntingdon.	Leighton Buzzard.	Henley.
Brentwood.	Cambridge.	Aylesbury.	Alton.
Eastchurch.	Hendon.	Oxford.	Amesbury.
		Brooklands.	

A competitor may start from any point named in the circuit, provided always that the complete circuit is accomplished without alighting.

3. The flight must be observed at each point named in the circuit by officials appointed by the Royal Aero Club.

4. A number must be prominently displayed on the aeroplane in places approved by the officials, and when flying round each of the points selected in the circuit, the aviator must fly sufficiently low so that his number may be easily verified by the official observer.

5. The circuit must be completed between the hours of sunrise and sunset, on any one day.

6. The entrant, who must be the person operating the machine, must be a British subject flying on a British-made aeroplane, must hold an Aviator's Certificate, and must be duly entered on the Competitors' Register of the Royal Aero Club.

7. The complete machine, and all its parts, must have been entirely constructed within the confines of the British Empire, but this provision shall not be held to apply to raw material.

8. An entrance fee of £1 must accompany every notification of an attempt, and at least three clear days' notice must be given to the Secretary, Royal Aero Club, 166, Piccadilly, London, W.

A competitor must further deposit a sum of £10 on account of expenses, if any, of observers. Any balance not so expended will be returned to the competitor.

9. Should any questions arise at any time after the date of entry as to whether a competitor has properly fulfilled the above conditions, or should any other question arise in relation to them, the decision of the Committee of the Royal Aero Club shall be final and without appeal.

10. A competitor by entering waives any right of action against the Royal Aero Club or the Michelin Tyre Co. for any damages sustained by him in consequence of any act or omission on the part of the officials of the Royal Aero Club or the Michelin Tyre Co., or their representatives or servants, or any fellow competitor.

11. The aeroplane shall at all times be at the risk in all respects of the competitor, who shall be deemed by entry to agree to waive all claim for injury either to himself or his aeroplane, or his employees or workmen, and to assume all liability for damage to third parties or their property, and to indemnify the Royal Aero Club and the Michelin Tyre Co. in respect thereof.

12. The Committee of the Royal Aero Club reserves itself the right to add to, amend or omit, any of these rules should it think fit.

HAROLD E. PERRIN.
166, Piccadilly. Secretary.

PROGRESS OF FLIGHT ABOUT THE COUNTRY.

NOTE.—Addresses, temporary or permanent, follow in each case the names of the clubs, where communications of our readers can be addressed direct to the Secretary. We would ask Club Secretaries in future to see that the notes regarding their Clubs reach the Editor of FLIGHT, 44, St. Martin's Lane, London, W.C., by first post Tuesday at latest.

Aero Club of Ireland (34, DAWSON STREET, DUBLIN).

AT the annual general meeting of the Aero Club of Ireland, held on the 22nd ult. at 34, Dawson Street, Dublin, when the Right Hon. the Earl of Mayo, K.P., presided, a very satisfactory report was presented by the Committee. This showed that a good deal of useful work had been done by the Club in the cause of Irish aviation, while the balance-sheet showed that the Club had a balance in hand of £462 16s. 11d. Of this amount, £421 18s. 9d. represented the surplus of receipts over expenses in connection with the Leopardstown meeting. The expenses at that meeting amounted to £2,489 1s., while the receipts were £2,910 19s. 9d. Needless to say the report was adopted unanimously, and it was decided to offer a prize of £100 for the longest flight made in Ireland before October 1st next.

Aldershot Aero Club (116, VICTORIA ROAD).

THE recent lecture by Mr. S. F. Cody, under the auspices of the above club, was a complete success, being listened to by a fairly large audience for about two hours. The chair was taken by Mr. Bacon, a cousin to Miss Gertrude Bacon, who is going to do his best to bring the club forward.

Mr. Richardson, a member of the club, is exhibiting at Olympia a tail plane of the glider made by him for the club; this glider is a fine piece of work, being not only very strong but at the same time very light. The club is only waiting to find a suitable workshop, when they will at once proceed to erect the machine.

Amateur Aero Club (KINGSTON-ON-THAMES).

THIS club has been formed for the benefit of those residing in Kingston-on-Thames. There is no entrance fee, and the annual sub-

scription is 2*s*. 6*d*. Already a number of good model aeroplane flights have been carried out, and it is hoped that more members will come along. Application for further particulars should be made in writing to the secretary, A. H. Weeks, 49, Birkenhead Avenue, Kingston-on-Thames.

Birmingham Aero Club (165, HAMPTON STREET).

IN reference to the prospectus of the forthcoming Exhibition at Bournville, Class 15 is for hand gliders, and £1 will be awarded for the longest flight, and 10*s*. for the second longest. Entry fees the same as for Class 5.

Also it should be noted that the rule as to fees does not apply to the All-Champions' Sweep. Everyone must pay the full amount, as the object is to provide a substantial sum for division between the successful pair.

East London Aero Club (ALEXANDRA HOTEL, STRATFORD, E.).

THE next model flying meeting will be held on Saturday, April 8th, at Creekmouth, Barking, at 3.30. Kite flying will also be indulged in. Prizes will be awarded for length of flight, quickest flight, and stability. A prize will also be given for the longest glide of a model launched from the gliding hill. A one-third scale model Blériot with motor is now being constructed at the workshop.

Tower Hamlets Branch.—Readers residing in the Tower Hamlets District will receive full particulars of this branch upon application to the sec. *pro tem.*, Mr. A. Hind, 52, Morville Square, Bow, E.

It is intended to open a workshop in the neighbourhood of Burdett Road.

Kite and Model Aeroplane Assoc. (27, VICTORY RD., WIMBLEDON)

THE following dates are the fixtures arranged up to the present, and are issued so that readers can note.

A complete list of events will be issued shortly, and would-be competitors should note that all competitions are free to members, therefore they would be well advised to join the association and should send in their applications at once. The subscription is: Seniors, 5*s*.; Juniors, 2*s*. 6*d*. a year.

May 20th.—Kite Competitions, Wimbledon, for President's Shield; also Junior Competition.

June 7th.—Sports Ground, Crystal Palace, High Flying Model Competition; Youths' Duration Model Competition.

June 14th.—Sports Ground, Crystal Palace, Duration Competition, for *Model Engineer* Cup.

July 5th.—Sports Ground, Crystal Palace, Competition for models rising from ground under own power, for Sir. Chas. Wakefield's Gold Cup.

July 11th.—Sports Ground, Crystal Palace, Steering Competition.

July 22nd.—London Aviation Ground. Long Distance and Stability for the Association's Silver Cup; Youths' Competition.

Aug. 12th.—London Aviation Ground. Longest Flight for Gamage Cup.

The hon. sec. will be pleased to receive donations towards the prize fund from those interested in the science. This Association on Thursday, 16th ult., held a meeting when an interesting paper was read on "Aerial Gunnery" by Mr. Cousin. The lecturer spoke as to the backwardness of this country as compared with Germany; nearly all the illustrations were of German guns. Afterwards Mr. A. V. Roe described a series of slides, showing his experiments with models and full size machines from 1905 onwards.

The next lecture will be by Mr. S. F. Cody on his failures and successes.

Model Club for Wandsworth and District.

A MODEL aero club is about to be formed in Wandsworth, and those living in the district who wish to join should communicate immediately with Mr. Lander, as the season has already begun. It is proposed to obtain a workshop thoroughly equipped with all necessary tools, &c. For further particulars please communicate with F. C. Lander, 13, Spencer Road, St. John's Hill, Wandsworth.

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FROM THE BRITISH FLYING GROUNDS.

Brooklands Aerodrome.

ON Wednesday morning of last week Mr. Sopwith paid an early visit to the flying grounds, and at 7 o'clock was testing his new engine. It proving satisfactory he had his aeroplane brought out, and covered three circuits of the ground in fine style. A little later Mr. Bell brought out the Hanriot, and did some rolling practice, after which Mr. Fisher made some straight flights on the Hanriot and showed decided improvement in his control of the machine. In the afternoon a light breeze got up, but Mr. Watkins brought out the Howard Wright and took several passengers for short trips, and also made some exhibition flights for the benefit of a cinematograph operator. Mr. Spencer and Mr. Dolphin were also flying. Thursday was windy, and the only flyers to venture up were Mr. Fisher and Mr. Pixton, who made several straight flights. Friday was a blank day, and the only flying done on Saturday was by Mr. Macfie, who made several short trips, and although the wind was blowing from 20 to 45 m.p.h. Mr. Macfie had the aeroplane well under control all the time.

Laffan's Plain.

THERE has been little or no flying here during the past week, in the absence of Mr. Cody and Mr. Leroy at Olympia, where the former's machine is attracting very great attention.

The Lebaudy airship is now being inflated, and every precaution has been taken for its safety, all girders and projecting parts of the hangar being thickly padded.

On Tuesday morning Capt. Burke was flying with the Farman, which has been thoroughly repaired and overhauled since its last accident.

London Aerodrome, Collindale Avenue, Hendon.

Blériot School.—Tuesday morning of last week being fine, the school machines came out for work. Mr. Henderson flew a complete circle and made a very good landing. He has been progressing very rapidly, and, given fine weather, his qualifying for the new brevet appears to be well within sight.

Mr. Champion showed in a very marked way that he has mastered the art of flying, for after making a few straight flights he covered a complete circuit, a very creditable performance, as owing to the bad weather his actual time on the machine has not been more than about two hours. Mr. Abercromby had some rolling practice and made a few hops.

Meantime Mr. Prier emerged with the new single-seater cross-country type, and made two very fine flights, making for the direction of Harrow until nearly out of sight, then turning back passed over the aerodrome steering for Mill Hill as his landmark. After circling the tower of the school there, he then returned to the aerodrome. Mr. Hamel was also out on his machine and flew for about 15 minutes.

Wednesday was too windy for pupils, which was unfortunate, as M. Blériot and Mme. Blériot had motored from town with Mrs. Norbert Chereau, and spent the best part of the afternoon at the aerodrome.

During his visit, Mr. Prier took out the cross-country type machine and made two flights outside the aerodrome, coming back to it several times during each, giving some fine effects with his grand *vols plané*.

At the same time Mr. Hamel got ready, and having fixed a barograph on to his machine, went up for altitude; he was up for about 15 minutes, and having reached a height of 5,600 ft., he descended with a long spiral *vol plané* lasting well over two minutes.

Bad weather once more resumed sway for the rest of the week and Monday was also a complete blank owing to the N.E. gale blowing.

Salisbury Plain.

THE weather on the morning of Wednesday week was ideal, and flying started early. M. Tetard was first out with the Bristol No. 12, and he was followed by M. Versepuy on the No. 19 E.N.V. biplane. Afterwards Mr. Maitland got into the machine and made a couple of circuits. M. Tabuteau was also out on a military type machine, and then he and M. Tetard spent some time giving instruction to the pupils and taking them for flights. The morning's work was brought to a conclusion by M. Tetard taking Mr. H. H. Bannister, a mechanic working in one of the sheds, to a height of 800 ft., followed by a fine *vol plané*. In the afternoon M. Tetard was out again, but after he had made one round trip a very heavy thunderstorm came on, and as it lasted for two hours it effectually stopped flying for the rest of the day. The blustery and rainy weather on the following morning put all thought of flying out of the question. In the afternoon, however, Tabuteau had the military type biplane with extensions out, and although a 20-mile breeze was blowing, he was up for three-quarters of an hour, only coming down because a wire had broken. After replacing the wire, M. Tabuteau made another trip, but in view of the increase in the force of the wind decided to stop flying for the day. Owing to bad weather no further flying was possible until Tuesday, which, although fine, was slightly gusty, and so gave little opportunity for work in the air. Another new Bristol machine has arrived, and it will be erected as soon as there is accommodation for it. Good progress is being made in the building of the new sheds referred to in our last issue, and preparations are being made to receive members of the Air Battalion from Aldershot next month, when they will undergo a course of instruction at the Bristol School.

BRITISH NOTES OF THE WEEK.

New British Michelin Prize.

THE regulations governing this series of prizes, commencing this year, are published in this week's official notices of the Royal Aero Club, page 294.

Alexander Motor Competition.

THE full regulations regarding the new competition for the prize of £1,000 offered by Mr. Patrick Alexander have now been issued, but pressure on our space precludes us from giving them in full this week. In the main the competition will be on similar lines to that held last year, the chief differences being that it will be open to motors of from 40 to 75-h.p. instead of 35-h.p., while the 24 hours' run will be divided into two periods of 12 hours each, throughout which each competing motor must average at least 40-b.h.p. The competition will be open to motors weighing not more than 8·5 lbs. per b.h.p. as declared by the maker. Three main points will be considered in making the award, viz. : (*a*) Gross weight per measured b.h.p. ; (*b*) Reliability and steadiness of running ; (*c*) Wear of working parts. Entries may be made up to June 30th next, while the engines will be required to be delivered for test not later than September 30th. Full particulars regarding the competition may be obtained of the Secretary, Advisory Committee for Aeronautics, Bushy House, Teddington.

A New Prize for Ireland.

AT the annual general meeting of the Aero Club of Ireland, held last week in Dublin, it was decided that the Club should offer a prize of £100 for the longest distance flown up to October 1st, 1911. The principal conditions are that the flight must take place in Ireland, and a minimum distance of 25 miles be covered. The full rules will be announced shortly.

Texture of Air Currents, &c.

Two lectures of absorbing interest to all interested in aeronautic problems are to be delivered before the Royal Institution on May 18th and 25th by Mr. W. Napier Shaw, M.A., LL.D., D.Sc., F.R.S., Director of the Meteorological Office. The subject will be "Air and the Flying Machine," and the first lecture will be entitled "The Structure of the Atmosphere and the Texture of Air-Currents," while the second will be on "Conditions of Safety for Floaters and Flyers."

Mishap with the Gaunt Monoplane.

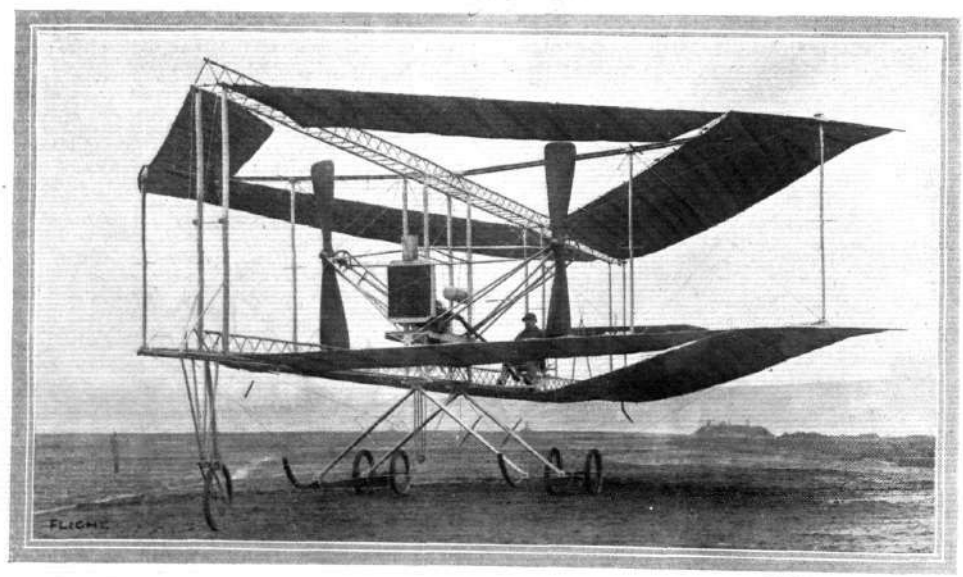
ON Tuesday week the Hon. W. S. Leveson-Gower, R.N., visited Southport with the object of trying the Gaunt monoplane, of which he is part owner. After two runs of about a mile each along the North Foreshore the machine on its third trial rose to a height of between 10 and 15 ft. It swerved to the left, and on recovering pitched forward and turned turtle. Fortunately the pilot was thrown clear and escaped with only a bruise or two. The left wing of the monoplane was buckled and the chassis damaged, while the propeller was broken to splinters.

An Echo of the North Sea Tragedy.

ON Monday last an application was made in the Law Courts for leave to presume the death of Mr. Cecil William Grace, who disappeared while making an attempt to win the De Forest Prize on Dec. 2nd last. Counsel explained the circumstances under which the application was made, and said every possible inquiry had been undertaken but without success. Leave was granted to presume the death on or since December 22nd, and it was stated that the estate amounted approximately to £31,000.

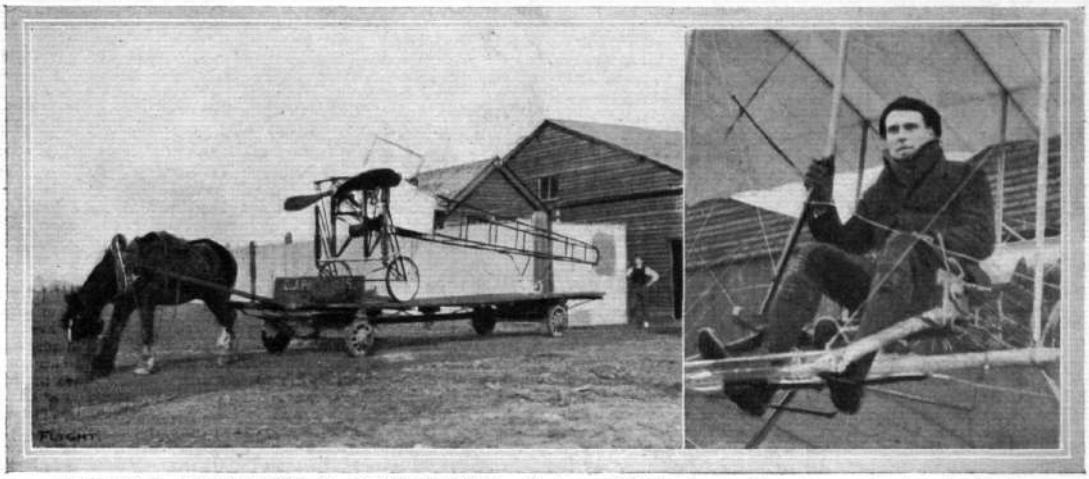
Mr. Paterson and the Schoolboys.

AT the invitation of Mr. Paterson, a party of students from the Liverpool Institute visited the Freshfield flying ground on Wednesday week, and after examining the machine in the hangar Mr. Paterson offered to take two of the boys for a trip to Southport. A ballot was resolved upon, and two boys named Duncan and Bromhead were the lucky winners. They eagerly took their seats behind Mr. Paterson, and after a short run along the ground the machine rose in the air, Mr. Paterson steering in the direction of Southport. On reaching that place the machine turned for home, which



"Flight" Copyright.

Quite one of the most interesting experimental machines down at Brooklands is that which was described in very full detail by us as long ago as February 5th last year. Not only does its unusually large size (a total surface of some 1,200 sq. ft.) render it notable, but the entire form of construction is quite unlike that of any of the other aeroplanes now in existence, and is based upon the results of a remarkable series of experiments that were conducted before this particular full-sized biplane was put in hand—results which seem to indicate the possession of an astonishing degree of automatic stability. A good general idea of the hollow rhomboidal (or diamond) shape is conveyed by the above illustration, as also of the special girder construction of the framework, and the disposition of the propelling mechanism.

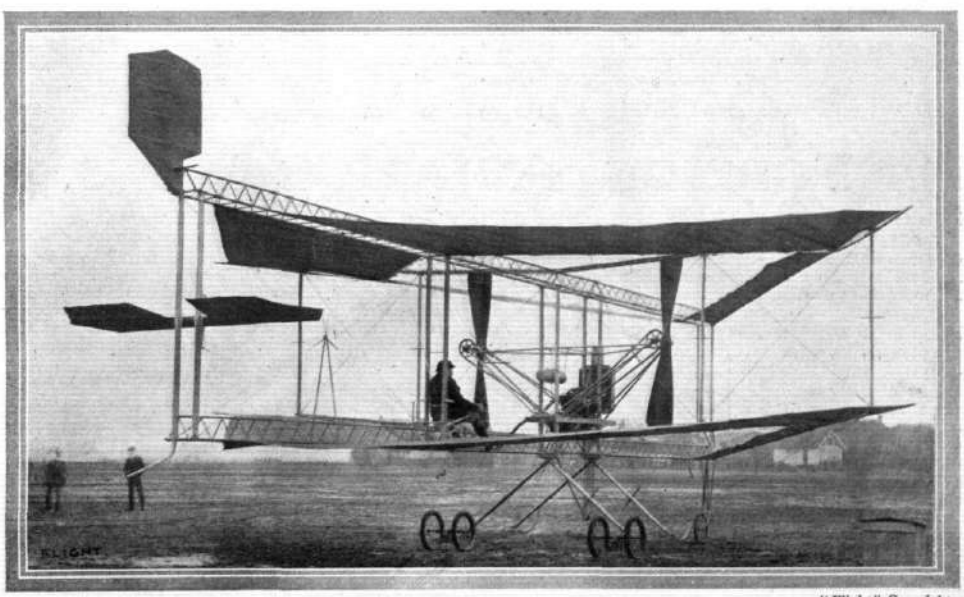


A 100 TO 1 REDUCTION IN HORSE-POWER.—Grahame-White's Gordon-Bennett racer leaving the London Aerodrome *en route* for the Royal Aero Club's stand at Olympia. On the right Mr. Ridley-Prentice, a pupil of the Grahame-White School at Hendon, who has made remarkably rapid progress, and has put up some good flights on the school Farman.

was reached without incident. The youths greatly enjoyed their experience although it was somewhat cold, and their subsequent vivid description made their companions wish that it had been possible for them also to have gratified their desires. Afterwards Mr. Paterson made a second successful trial with a passenger.

Australian Government and Aviation.

A good deal of attention is being given to the subject of aviation by the Australian Government, and on Wednesday of last week Captain Muirhead Collins, Official Secretary to the Federal Government of Australia; Major Buckley, Military Adviser to the High Commissioner's Office; and Mr. W. Kelly, Member of the House of Representatives—paid a visit to the British and Colonial Aeroplane Co.'s flying school on Salisbury Plain. M. Maurice Tetard made several demonstration flights for the benefit of the visitors, and he also took Captain Collins and Mr. Kelly for trips of five miles, while the latter also indulged in a similar trip, piloted by M. Maurice Tabuteau.



"Flight" Copyright.

Another three-quarter view—in this case from the rear—of the unique diamond-shaped biplane now being tested at Brooklands. This photograph shows the elevator and the rudder, both of which are attached at the extreme rear, and also perhaps serves to convey a useful supplementary impression concerning the *tout ensemble*. In front the converging planes are narrow, being only about 3 ft. deep, whereas those that join the front planes at the point of greatest width of the framework, and meet at the extreme rear, have a depth of some 9 ft. A Humber engine of about 50-h.p. is fitted.

Test of an E.N.V. Engine.

IN connection with the announcement that the British Government has placed a further order for a second E.N.V. engine of the 60-80-h.p. type, the following results, which were obtained in a test made by Mr. Mervyn O'Gorman with one of these engines on the 17th ult., are very instructive :—

"A 60-h.p. E.N.V. engine delivered 64-h.p. for five hours without intermission.

"The petrol consumption was measured at ·57 pint per b.h.p. hour.

"The lubricating oil was ·1718 pint per b.h.p. hour.

"Temperature of the cooling water about 40° C. Weight of the engine 337 lbs."

Another Aeroplane for the Air Battalion.

THE equipment at the disposal of the Air Battalion has received an addition in the shape of Captain Maitland's Howard Wright biplane, which has been purchased by the War Office. Several good flights have been made at Brooklands on the machine, which is of the standard type.

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GRAHAME-WHITE, BLÉRIOT, AND MAXIM, LTD.

THE prospectus is issued this week of the above Company, which has a share capital of £200,000, divided into 800,000 shares of 5*s.* each, there being neither preferred nor deferred shares. The present issue is of 560,000 shares, of which 260,000 are to be issued as fully paid in part payment of the purchase money. The balance of 300,000 shares is offered for subscription at par. As to the remaining 240,000 shares, these are reserved to provide further working capital if necessary, and are subject to an option for a period of three years under which Mr. Claude Grahame-White and Mons. Louis Blériot can each subscribe for 120,000 of them or any less number at par.

The object of the Company is to carry on the business of manufacturers of aeroplanes and of devices connected with aerial navigation, to conduct aviation schools, and to undertake the holding of and management of public and other aviation meetings. Altogether the Company appears to be founded upon good lines, and the securing of Mr. Claude Grahame-White, the very astute and well-known aviator, as managing director for a term of ten years, with M. Blériot as technical advisor for a term of five years, and Sir Hiram Maxim as chairman of the Company, the conduct of the business portion of the concern should be regarded as likely to be carried out on sound lines.

The other directors are Mr. H. W. Matthews, who is business manager of the Festival of Empire, and Lieut. W. G. Ramsay-Fairfax, R.N. An Honorary Advisory Committee is provided for, the members being Admiral Sir Edward Hobart Seymour, Lieut.-General Sir Henry Settle, Sir Edward Moss, Mr. J. T. C. Moore-Brabazon, and Mr. Arthur du Cros.

The Company is acquiring as from the 15th of December last the London Aerodrome leasehold property of 207 acres, held under ten year leases, from September last. This includes all the improvements and extensive work already carried out in connection with the aerodrome in fencing, levelling and draining, and the 17 hangars with the electric power plant, light railway, &c. as now in place at this Hendon flying centre. Beyond this the Company also acquires from M. Blériot all his British patents and inventions present and future for Great Britain, the Colonies and India.

The scope of the Company is extremely wide and under efficient guidance there should be an enormously successful future. Although it is difficult to probe the actual income which will ultimately accrue an estimated revenue and expenses has been set forth in detail in the prospectus, which shows that after placing £5,000 to reserve a sum more than sufficient to pay a dividend of 15 per cent on the whole of the share capital of the present issue should remain. The purchase consideration amounts to £97,000, payable as to £32,000 in cash and as to £65,000 in fully-paid shares, and after payment of these items and the preliminary and other expenses, together with the sum of £7,000 proposed to be expended on the erection of factories and £5,000 for purchase of the aeroplanes, &c., now at the aerodrome, and as valued by Mr. Howard Wright, there will remain available for working capital out of the present share capital offered for subscription approximately a sum of £23,000. Nothing apparently is being paid for goodwill.

The prospectus undertakes that no allotment will be made to the public unless a minimum of 220,000 shares of the present issue are subscribed, whilst notice is given that no part of the issue has been underwritten.

The lists opened yesterday (Friday) and will close on or before Monday next, April 3rd, at 11 a.m. for both town and country. The secretary and offices respectively are Mr. Guy Livingstone, 1, Albemarle Street, W., and abridged details of the present issue appear in our advertisement columns of this week.

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FOREIGN AVIATION NEWS.

A Paris to Madrid Aeroplane Race.

THE *Petit Parisien* has announced that it is organising a race for aeroplanes to take place during the second fortnight in May. The prize is to be 100,000 francs (£4,000), and the course from Paris to Madrid.

A Dozen in an Aeroplane.

INTERSPERSED with his attacks on speed records M. Breguet has been indulging in successful experiments in passenger carrying at his flying ground at Douai, and on the 23rd ult. he succeeded in transporting eleven passengers besides himself over a distance of about 3 kiloms. It is true some of the passengers were somewhat youthful, but the live load carried was 597 kilogs., while there was also 35 kilogs. of petrol on board. On the previous day M. Breguet had made a flight with six passengers weighing 478 kilogs., while with the petrol, &c., the useful load totalled to 574·5 kilogs., and the aviator was officially timed to attain a speed of 100 k.p.h. The average height during the flight was 20 metres.

Sommer Goes One Better.

ON hearing of this exploit of Breguet, M. Roger Sommer determined to do better, and so at Douzy on the 24th ult., after squeezing twelve passengers on his machine, he mounted into the pilot's seat, and with this load—weighing 650 kilogs.—he rose in the air and flew for a distance of just under a kilometre. Just previous to this he had taken eight passengers on his machine and flown with them for a quarter of an hour.

Test With the New Military Sommer.

ON the 24th ult. M. Sommer was testing one of the new biplanes which he has constructed to take part in the forthcoming French Military Competition. Taking with him as passenger Lieut. Girard, and with the latter's baggage as well as a spare Gnome engine stowed securely on the machine, M. Sommer rose from the ground at Mouzon and flew over to Douzy, where he safely landed, afterwards returning to Mouzon.

A Youthful Goupy Pilot.

THE ranks of pilots of the Goupy type of machine have received a notable addition in Pierre Divetain, who on the 24th ult. succeeded in qualifying for his aviator's certificate. He is only eighteen years of age and has had an adventurous career. He started cycling at seven, and at thirteen was publicly presented with a medal for saving a comrade from drowning; while at sixteen he was a fully qualified motor car driver.

Cross-Country Flying by Vedrines.

IN view of his intention to try to fly from Paris to Pau and to win the Coupe Pommery, Vedrines made several cross-country flights on his Morane monoplane on the 21st ult. Starting from St. Cyr, he flew over to Etampes, and on his way back landed for a short time at Buc. In the afternoon he flew over to Issy, rising on the way to a height of 1,750 metres.

Fatal Accident to Cei.

DURING the past few weeks the young Italian aviator Cei has been making remarkably good flights on his Caudron biplane,

including a trip across Paris, and it therefore came as a great shock to his many friends to learn that on Tuesday evening he had met with a fatal accident. He left Issy about half-past five, and rising to a good height went off in the direction of Puteaux. While crossing the Seine by Suresnes the aviator appeared to lose control of the machine, apparently through the motor failing, and it fell rapidly to the ground, landing on the Ile de Rothschild. The accident was witnessed by a boatman, who immediately procured assistance, and the aviator was taken to the Beaujon Hospital, where, however, the aviator succumbed to his injuries about three hours later.

Flying Although Crippled.

IN making his journey from Biarritz to Pau last week, Lieut. Malherbe was forced to come down at Urcuit through his motor failing. In the sudden landing he severely sprained his foot, but although he was unable to walk properly he was again flying a few days later, and on the 26th flew over to Auch, taking a pair of crutches with him on the machine to assist him when landing. Two other officers, Lieuts. Conneau and Princeteau, also flew over on their Blériot machines at the same time, while on the following day Lieut. Rose joined them at Auch.

Farman Tries a Four-Bladed Propeller.

ON the 21st ult., at Mourmelon, Mr. Henry Farman was carrying out some tests with one of his racing machines which he has fitted with a four-bladed S.C.R.T. propeller. Louis Dufour was testing some of the biplanes built for the Army, and on one of them made a flight of two hours with a passenger.

Bobba Back at Juvisy.

ON the 23rd ult. Bobba arrived back at Juvisy, having flown over from Chartres, while two days previously he had flown with his friend Trotton from Orleans to Chartres. On the way they were caught in a violent squall of wind, and Bobba had a struggle to keep the machine on a level keel.

Michelin Prizes Presented.

AT the annual meeting of the Aero Club of France, held in the Sorbonne on Saturday last, the Minister of Public Works, M. Ch. Dumont, presided, and was supported by the President of the Club, M. Cailletet, MM. Michelin, Blériot, Leblanc, &c. The chief item on the programme was the presentation of the two Michelin prizes by M. Michelin himself, and the recipients, M. Eugene Renaux, the winner of the Puy de Dome prize, and M. Maurice Tabuteau, winner of the International prize, both came in for a great ovation. The list of records made during the past, which was read out, also evoked considerable applause amongst the vast audience.

Resignations in France.

FOLLOWING upon the resignation of M. Leon Barthou from the chairmanship of the Commission Sportive Aero nautique, another member—M. E. Archdeacon—has also resigned, giving as his reason his dissatisfaction at the disqualification of the Aeronautique Club of France, which he characterises as an injustice. M. Leon Barthou's place on the C.S.A. as a delegate of the Aero Club of France has been filled by M. Paul Tissandier, while Count Castillon de St. Victor has been elected Chairman. M. Deutsche de la Meurthe succeeds M. Barthou as a Vice-President of the Ae.C.F., which office he has also resigned.

To Commemorate Cross-Country Flying.

WORK will be commenced shortly on the monument which the Aero Club of France is erecting at Calais in order that the record of the first flights across the Channel may not be without witness in future generations. The monument will consist of a pyramid 4 metres high, placed on a pedestal. On the principal face will be an escutcheon bearing an inscription recording M. Blériot's cross-Channel flight, and above it will be a representation of the machine. The sides will bear inscriptions making appropriate references to the subsequent attempts of M. Jacques de Lesseps, the late Hon. C. S. Rolls, the late Mr. J. B. Moisant, and the late Cecil Grace. The ground on which the monument is being erected has been given by Madame Hochort-Deletres. It is hoped that the monument will be ready for unveiling on July 13th.

How They Do It in France.

IN connection with the competition for French-built machines, which is being organised by the Aero Club of France, Count P. d'Angenson, who represents Chatellerault in the Chamber of Deputies, has written to the Club stating that his constituency will guarantee a sum of 25,000 francs towards the prize fund if Chatellerault is made the first stopping place on the tour. It is proposed that the stages should be Paris, Chatellerault, Bordeaux, Pau, Toulouse, Bordeaux, Paris. It is to be hoped the places selected for controls in the *Daily Mail* prize competition will follow this excellent example.

M. Koechlin Retires from Business.

IN order that he may be free to devote himself to research work in connection with aviation, M. Koechlin has decided to give up the work of constructing aeroplanes, and his factory has been taken over by M. Pivot, who will continue to turn out the monoplane with which considerable success has been attained by M. Koechlin, Madame Marthe Niel M. Weiss, and others.

Another Cross-Country Event for Germany.

IN view of the decision to abandon the proposed cross-country race from Aix-la-Chapelle to Berlin, the municipal authorities at Cologne are taking the initiative in organising a cross-country race from Cologne to Aix-la-Chapelle and Essen. It is intended that this shall take place immediately after the German Gordon-Bennett eliminating trials.

Long Military Flight in Germany.

LEAVING Doeberitz at 3.30 p.m. on the 23rd ult., Lieut. Förster, accompanied by Lieut. Mahnke, passed over Reinickendorf at 4 p.m., and at 6.30 p.m. a landing was made close by Frankfort-on-Oder, a distance of about 115 kiloms. having been covered. The aviators intended to go on further, but were brought down owing to motor troubles.

Two New Belgian Military Aviators.

FOR some time two officers of the Belgian Army, Lieuts. Bronne and Lebon, have been learning to fly at the school established at Kiewit by the Chevalier de Lammine, and on the 22nd ult. they succeeded in making the necessary tests to obtain their pilot certificates. The machine used was a Farman biplane.

Christiaens at Singapore.

A SERIES of flights were made in the neighbourhood of Singapore on Saturday week by M. Christiaens, using one of his Bristol biplanes. Some difficulty was experienced in getting the machine to rise to any considerable height, this being due, it was stated, to the rarity of the atmosphere.

AIRSHIP NEWS.

"Capitaine Marchal" on Trial.

THE dirigible "Capitaine Marchal," which has been built by MM. Lebaudy Frères to present to the French Army to replace the "Republique," is now undergoing her trials. The vessel is an improvement on the "Liberté" type, and is 85 metres in length with a capacity of 7,200 cubic metres. It is fitted with two 60-h.p. Panhard motors, presented by MM. Panhard et Levassor. At its début on the 24th ult. the vessel cruised for over an hour above Moisson, and everything appeared to be in perfect order. Nine persons were on board:—Captain Bois; Lieut. Tixier; three non-commissioned officers; M. Julliot, the designer of the airship; M. Schaeffer, the chief mechanician of the Panhard-Levassor Works; M. Landrin, the assistant pilot; and M. Arsale, the mechanician.

Progress With the Spiess Dirigible.

THE first section of the great Spiess rigid dirigible, which is being erected at the Zodiac works at St. Cyr, has now been erected, and the work of completing the airship will be pushed on with all speed. It is hoped that the airship, which will have a gas capacity of 10,000 cubic metres, will be ready for her trials at the end of the summer.

Zeppelin Competition Postponed.

THE cross-country competition between Ulm and Friedrichshafen being organised by the Society of German Technical Aviators for the prize offered by Count Zeppelin, has been postponed from April 9th–21st to August 5th–25th.

PROBLEMS RELATING TO AIRCRAFT.

By MERVYN O'GORMAN.

(*Continued from page* 266.)

42. **Massing the Weights near the Centre of Gravity.**—There are reasons for keeping the moment of inertia of the aeroplane round its centre of gravity as small as it possibly can be kept, and we must not attempt to improve on the effects above indicated, by spreading the weight to add to the inertia of the wings for example, otherwise we shall soon find trouble which will far outweigh these small advances towards stability.

43. One more suggestion is to free the two main wings so that they can bodily flex or hinge upwards to a limited extent; and to connect each wing by a pull wire to an aileron at the other side.

The object of this arrangement is that, if a local gust lifts the right wing, its movement upwards shall, by pulling the

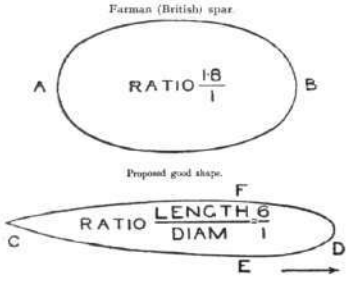

Fig. 14.—Showing the contrast between the sections of a spar of a British-made Farman aeroplane and a good fair shape for dirigible work. The eddy caused by the spar will be considerable.

left aileron down, thus throwing down more air on the left, at once lift the left wing to a corresponding degree. The movements should be nearly simultaneous so as to avoid a delay during which equilibrium may be lost sufficiently for the man to become aware of it; the mere flexing upwards of the whole of the right wing in itself, apart from the control of the opposite aileron, conduces to stability, since this movement reduces the effective supporting area, and alters the direction of its reaction.

44. **Head Resistance.**—The one essential improvement which we require in aeroplanes, other than in stability, is the diminution of their head resistance. To make the idea graphic at once it is only necessary to state that during certain periods the average w nd over large portions of the globe, including parts of the British Isles, is reputed to move slightly (*i.e.*, at an angle of 4°) upwards; if therefore we could reduce the head resistance of our aeroplanes till their gliding angle instead of being 8° were 2°, we could often remain in the air like birds supported by the wind, fluttering, perhaps, from point to point to keep in the upstream, but still acquiring a totally new advance in the art of flight.

Progress in connection with the diminution of head resistance can only be made by an extremely slow process, namely, the detailed study of every individual organ and part. It is a double investigation—we require to sacrifice nothing of strength—yet we must gain all that can be taken away of head resistance.

45. **Spars.**—All spars at present in use have a section which is more or less fair shaved, but if we compare them to the shape found to give the minimum head resistance for irigibles we get the contrast shown by Fig. 14, in which the spar section appears much too fat for its length, and has the maximum diameter too near the middle part. We want to know as a certainty (for we already suspect it strongly) that less head resistance and weight would be involved by making larger spars of better form and fewer in number. When, however, we begin to give to the spar an appreciable depth, C, D, the fin effect of this will react a little upon the steering quality and stability of the airplane in gusts, and this must be tested before any statement of the utility of such an alteration can be made.

46. It does not necessarily follow that the airship form, having the maximum diameter at F, E, is the best for struts, but at any rate one machine which has a notably good gliding angle adopts these thin-shaped spars—I mean Mr. Cody's—which is often careering about Laffan's Plain and Farnborough Common. I have pleasure in thanking him for the several occasions on which I have been his passenger.

47. **Curved Planes.**—The total skin frictional resistance of an aeroplane is about 10 per cent. of the whole resistance, and in investigating the subject it seemed advisable to study the form resistance carefully, and above all the lift, drift, and movement of the centre of pressure for various inclinations of each. Thus a series of aeroplane curves linked together by some common mathematical quality was necessary before any intelligent sequence could be given to a series of experiments. Supposing one has got a set of equations which include all the curves of all known aeroplanes, [and I will show how this may be done,] we may proceed as follows — Make a model according to any selected equation, conduct a quantitative experiment upon it, and repeat this experiment on other models whose equation differs from the first by one variable only. Plot the curves and find the minima and maxima desired.

48. I do not propose to enter into any details of the experimental investigations, but the equation method is as follows:—

After many hours of assiduous "trial and error" and plotting work at various times by Mr. W. C. Claypole, Mr. John Damon and Mr. Watts, we found that the head equation of any such shape can be given by a curve of the form

$$ay^m = x^n (x - b)^2 \qquad \text{(Equation A.)}$$

while the trailing end is given by another curve of very similar equation, viz.:—

$$cy^{m'} = x^{n'} (x - b)^2 \qquad \text{(Equation B.)}$$

with very little trouble these two curves are made to meet and osculate at a point of maximum rise.

An investigation of these equations shows that—

The constant a determines the rise,

The constant b determines the chord,

While m determines the quickness of curvature of the curve,

And n the position of the maximum camber.

49. **The Effect of Varying** m.—If m increases the leading edge becomes bluffer, *i.e.*, bluntly curved down; if m' increases the trailing edge becomes bluffer, *i.e.*, bluntly curved down; but the effect of m is always more marked because of the forward position of the maximum camber.

For a value of $m' = 1$ the trailing edge becomes cup-like and lies parallel with the chord, but a smaller value of m can usefully be employed for the leading edge curve.

50. **The Effect of Varying** n.—In practice the position of the maximum ordinate of the curve—*i.e.*, the maximum height of the camber is distant from the front of the plane from 25 per cent. to 35 per cent. of the length of its chord. Now it can be shown that if this percentage is expressed by p,

$$\text{then } p = 33{\cdot}33n^{\cdot 7186} \qquad \text{(Equation C.)}$$

when n is the exponent of x in Equations A and B above.

For instance, if $n = 0{\cdot}68$, then the maximum camber occurs at a point one-fourth of the distance along the chord. If the maximum camber is required one-third of the way along, then $n = 1$, and the Equation A becomes expression

$$ay^m = x(x - b)^2,$$

(*To be continued.*)

⊛ ⊛

Invention During 1910.

AERONAUTICS are still most prominent in the field of inventive activity, according to the annual report of the Comptroller-General of Patents. It states that efforts are now being mainly directed towards perfecting the details of aeroplanes, such as the balancing, controlling and landing devices. But, in addition, the development of the science is making itself evident in other fields of invention. One of the most striking examples of this is seen in the increase in the number of internal-combustion engines adapted for flying machines, particularly in those engines having revolving cylinders.

Aeronautics have also made possible a new mode of attack in time of war, and to meet this danger inventors have been giving much attention to guns and projectiles suitable for destroying aerial craft.

CORRESPONDENCE.

**** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

Correspondents communicating with regard to letters which they have read in FLIGHT, would much facilitate ready reference by quoting the number of each such letter.

NOTE.—*Owing to the great mass of valuable and interesting correspondence which we receive, immediate publication is impossible, but each letter will appear practically in sequence and at the earliest possible moment.*

Horse-Power.

[1124] Seeing engines bought termed 25-h.p. engines, which certainly have not *five* "real" horse-power, one begins to wonder what is a horse-power, and from what is a standard horse-power taken.

Perhaps you will state in your columns what is the *actual* weight in lbs. that *one* "real" horse-power *will* lift direct from the ground.

Thanking you in anticipation,

Newcastle-on-Tyne. INVESTOR.

[James Watt originated the horse-power unit and based his data on the actual performance of horses working at a pit-head. He rated a horse in this way at 22,000 ft.-lbs. per minute, but decided that he would give good value for money in his engines and therefore increased the value of the horse-power unit to 33,000 ft.-lbs. per minute, which it remains at the present day. 1-h.p. is, therefore, the capacity for doing 33,000 ft.-lbs. of work a minute,—ED.]

A Question of Sparking-Plugs.

[1125] We are quite sure that your advertisers—The Bosch Magneto Co., Ltd.—would not intentionally wish to make misleading statements, nor attempt to take credit where it was not due; but we notice in their announcement in your issue of March 25th a statement to the effect that superiority in connection with their magnetos and sparking-plugs is reflected in, amongst other achievements, Mr. Sopwith's cross-Channel flight, which won the Baron De Forest £4,000 prize.

From this—more especially as Mr. Sopwith's flight is placed first in the list of achievements—it might easily be gathered by anyone not conversant with the facts that Bosch plugs were used on this notable occasion. But, if we might be allowed to say so, the sparking plugs which Mr. Sopwith actually used (and which he has always used regularly on his flights) were the *Lodge* patent "self-cooling" plugs.

We know perfectly well that no one would be more ready to admit this than the Bosch Co. themselves. We merely point out the fact, as otherwise, by the way their advertisement was worded, many might have been misled.

14, New Street, Birmingham. LODGE BROS. AND CO.

Dipping Front Edge.

[1126] Concerning the dipping front edge question and your remarks on it following letter 1036 from Mr. A. A. Griffith, I think your explanation a little confusing because you use the expression "virtually falling." In explaining other problems, the aeroplane is sometimes regarded as "going uphill" or "virtually rising," which shows what various things the word "virtual" can be made to denote. You say that a flat plane falling normally or nearly so will have a cyclic up-current round its edges, however small the vertical velocity. Then when the vertical velocity is zero, it is stated to be still "virtually falling," presumably because it is now also imagined as having a horizontal velocity. The thing is by no means clear, especially when no definition of "virtually" is given.

Surely it is better to think of what *actually* happens. A plane with a normal air-stream has a cyclic current; this is indisputable as we know that any vacuum which tends to be formed is soon filled up by the nearest air.

Incline the plane to the stream, and the cyclic current will still exist, though the air will run *along* the surface of the plane more. With a plane edge-on the air all passes straight along the surfaces.

Therefore considering the case of a moving aeroplane and its *actual* air stream, which is *horizontal, this* stream will cause a cyclic current round the front edge, without assuming any virtual vertical stream. Therefore the dipping front edge is used to take advantage of this current, or to destroy it, as it can no longer be said to be cyclic if it does not leak round the edge. There will, of course, also be a small tendency for a cyclic current to form round the trailing edge, when the pressure beneath the plane is suddenly released, and this may be the reason for the "no-dip back edge," as it might be called, *i.e.*, the lessening of curvature to the rear, so common in recent plane sections. Both cyclic currents are caused by pressure beneath the plane (extending slightly in front of it), but this pressure is directly caused by the *horizontal* air-stream on the plane inclined to it.

But I cannot agree with you in taking the angle between the tangents to the entering and trailing edges as the effective angle of deflection. The air is first at rest, and then after the passing of the machine has a downward velocity equal to that given by the *trailing* edge. The energy represented by this velocity is clearly that given to the air finally, whatever rising or falling it may have suffered in the process. The aeroplane spends as much energy in making the cyclic current as it takes from it, for this taking advantage of it is only the recovery of a loss or leakage. In short, the dipping edge exists partly to *decrease* the *drift* by avoiding shocks and eddies, and partly to *prevent decrease* of the *lift* by leakage, but cannot *increase* the lift above that given by the angle of the trailing edge. To assume that an aeroplane can gain extra support from a current of its own making is like thinking that there would be greater power in a water-wheel if it drove a pump which raised some of the spent water to the top of the wheel again. To clearly understand the nature of the fallacy, think of the extreme case of an aeroplane moving horizontally with a dipping front edge and horizontal trailing edge, when, according to this theory, it should exert a lift, whereas actually we know a downward thrust would result. Such an aerofoil might *glide*, but that would only happen because the trailing angle was positive to the line of descent.

Wimbledon. B. BRUCE-WALKER.

[Our correspondent remarks "The aeroplane spends as much energy in making the cyclic current as it *takes from it*" (the italics are ours). In what way is the energy expended *on* the cyclic current restored to the machine except as a contribution to the dynamic lift?—ED.]

Man Flight.

[1127] Having observed how easily large birds appear to fly I should like to know your opinion as to whether man-operated artificial flight will ever be possible.

York. JOHN CARR.

[If by man-operated flight is meant the attachment of wings to the arms then certainly we do not believe that man will ever fly in this sense, for, apart altogether from the question of the power required, the anatomy of the human frame is not such as to give the necessary muscular development in the place required, nor does it prov de a suitable relationship between the centre of gravity of the body and the position of the artificial wings. Large birds more often fly by soaring than by flapping their wings and the soaring they accomplish is at the expense of the energy in the wind, which, to make soaring possible, must either have an upward trend or be gusty. There is no reason why extended practice in gliding should not ultimately result in the fairly frequent accomplishment of extended feats in soaring. It was always Lilienthal's ambition to reach this stage of proficiency in the art that he made so essentially his own. Wilbur Wright sometimes soared for short periods on his glider but no one has yet achieved a really protracted soaring flight. By soaring is, of course meant prolonged sustentation in the air beyond that ordinarily derived from gliding flight.—ED.]

Lift of Hydrogen.

[1128] Would you kindly oblige me by telling me the number of cubic feet of pure hydrogen required to lift a weight of 100 lbs.

Montreal, Canada. E. H. BINKS.

[See "Flight Manual" N. 130. Hydrogen lifts 74 lbs. per 1,000 cub. ft. (approximately) ∴ 1,350 cub. ft. required.—ED.]

MODELS.

Model Petrol Engines.

[1129] It may interest your readers to know that we have had a great many enquiries in reference to small petrol engines, asking whether they are a success. Our model expert, who has had a great deal of experience in these during the last three or four years, which have been used for model racing motor boats, hydroplanes and heavy model aeroplanes, during the last twelve months has met with excellent results; but as we have found through experience, that a great number of those who use petrol engines waste a great deal of money and time through inexperience when buying petrol engines, and therefore we should be pleased to give free advice to anyone who is contemplating going in for petrol engines, and give any such hints as may suggest themselves by the peculiarities of the case. The value set upon your paper as a medium for advice and advertisement is brought to our notice continually by the references made thereto by those who write to us for information.

97, New Oxford St., W.C. J. BONN AND CO., LTD.

Propellers on Models.

[1130] I would like to point out that I think it is an advantage when making model monoplanes to arrange the centre of the propeller below the level of the planes, which gives the front plane a greater lift. Perhaps this information may be of some use to model-makers.

Manchester. J. KENLEY.

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Aviation World and Industrial Directory, Ltd., 98, Jermyn Street, S.W.—Capital £3,000, in £1 shares (1,000 pref.).

Grahame-White, Blériot, and Maxim, Ltd., 1, Albemarle Street, W.—Capital £200,000, in 5*s.* shares. Acquiring the London Aerodrome, at Hendon. The patents of Louis Blériot for Great Britain and Colonies. First directors: Sir Hiram Maxim (Chairman), H. W. Matthews, Lieut. W. G. Ramsay-Fairfax, R.N., Louis Blériot, and Claude Grahame-White (managing director).

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PUBLICATIONS RECEIVED.

How to Build an Aeroplane. Second Edition. By Robert Petit. London: Williams and Norgate, 14, Henrietta Street, W.C. Price 2*s.* 6*d.* net.

The Flight of Birds. Aeronautic Classics No. 6. London: King, Sell, and Olding, Ltd., 27, Chancery Lane, W.C. Price 1*s.* net.

Catalogues.

Aeroplane Accessories. Rubery, Owen, and Co., Darlaston, South Staffs.

North British Aeroplane and Balloon Fabrics. The North British Rubber Co., Ltd., Castle Mills, Edinburgh.

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Aeronautical Patents Published.

Applied for in 1910.

Published March 30th, 1911.

5,248. C. LORENZEN. Screw-propellers for aerial machines.
5,908. MISS S. O'NEILL. Flying machines.
12,514. G. C. TAYLOR. Aeroplanes.
17,145. E. H. ANDRAE. Aeroplanes.
18,482. F. W. B. HAMBLING. Flying machines, aeroplanes.
18,604. R. ESNAULT-PELTERIE. Flying machines.
23,645. H. S. WILDEBLOOD. Rudders in aeroplanes.
26,067. R. K. MOBIUS. Kite having shape of an airship.
27,294. G. SILVESTRI. Flying machines.

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DIARY OF COMING EVENTS.

British General Events.

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July 1 .. Gordon-Bennett Aviation Cup Contest.
July 22-Aug. 5 *Daily Mail* Round England Contest.
Oct. 31 .. Close of British Michelin Cup.

Foreign Fixtures.

April 9-21 .. German Circuit—Ulm, Frankfort, Friburg, Strasburg, Carlsruhe Mannheim, Wiesbaden (1016).
April 16 .. Dresden Meeting.

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